Sex Differences in Direct Aggression: The Role of Impulsivity, Target Sex, and Intimacy with the Target

CROSS, CATHARINE,PENELOPE

Sex Differences in Direct Aggression:

The Role of Impulsivity, Target Sex, and Intimacy with the Target

Catharine Penelope Cross

Submitted for the degree of Doctor of Philosophy

Durham University

Department of Psychology

2010

DECLARATION

The material in this thesis has not previously been accepted in substance for any degree, nor is it being concurrently submitted in candidature for any other degree.

This thesis is the result of my own independent work except where otherwise indicated. Material from other sources has been acknowledged and full references are given.

I hereby give consent for my thesis, if accepted, to be available for photocopying and for inter-library loan, and for the title and summary to be made available to outside organisations.

Signed……………………………………

Date……………………………………...

NOTE

Pages with borders denote material which has been published in peer-reviewed journals. Although the published material appears in journals where US English is preferred, UK English spellings have been used throughout this thesis for continuity.

ACKNOWLEDGEMENTS

I would like to thank my supervisor Professor Anne Campbell for her support through the PhD process, long hours of work on collaborative papers, reading seemingly endless drafts, and getting me interested in aggression research in the first place.

Thanks go also to my second supervisor Dr Lynda Boothroyd, particularly for invaluable help with data collection, a necessarily gentle introduction to HTML, and generally helping me to think like a researcher.

This work was undertaken while I was a Teaching Assistant at Durham University, and I acknowledge the Psychology Department for its financial support.

I thank Lee Copping for his collaboration on the meta-analysis, and Will Tee for providing the pilot for the study in Chapter Four.

I'm also grateful to Ala Hola, for supporting me in my teaching while this thesis was under construction; Steve Muncer, for statistical advice; and Dave Knight, Elaine Stanton, and Richard Stock, who provided technical help.

I was lucky enough to be part of a cohort of Durham postgraduates who were also a great bunch of human beings, in particular Keira Ball and my fellow teaching assistants, Anastasia Kourkoulou and Chiew Kin Yung.

My family deserves a special mention, especially my Mum, Anne, who heroically refrained from asking when I was going to get a real job/husband/life for most of the time; my brother Stephen, who is at the time of writing on a PhD mission of his own; and my sister Jackie, who got the whole family's artistic talent genes.

Finally, I'd like to thank my two closest friends for being there for me through the most difficult parts of this process. Kate Thompson provided me with tea and sympathy, while Mark Benson provided me with a kick up the backside and an exhortation to get on with it. It was a good combination.

CONTENTS

List of Tables

Chapter Two

Chapter Three

LIST OF FIGURES

ABSTRACT

Men are, as a sex, more aggressive than women. Evolutionary accounts of the sex difference in direct aggression focus on the differing costs and benefits of aggression for men and women, and posit that male aggression and female non-aggression are both part of a suite of adaptations to sex-specific selection pressures. However, greater male aggression is not evident in studies of intimate partner aggression conducted in Western cultures. The present thesis sought to integrate evolutionary accounts of the sex difference in direct aggression with research on intimate partner aggression showing gender symmetry in aggressive acts.

The proposed proximate mechanisms for the sex difference in direct aggression are myriad, but one of the most extensively investigated is impulsivity. The present thesis therefore sought to establish the presence or absence of sex differences in impulsivity, and identify the forms of impulsivity most likely to mediate the sex difference in aggression. Chapter Two presents a meta-analysis of sex differences in psychometric and behavioural measures of impulsivity. Sex differences are consistently present on those forms of impulsivity which are affective or motivational as opposed to cognitive in nature, and which incorporate some element of risk. Risky impulsivity, a personality trait reflecting a tendency to take risks without prior thought, was identified as a strong candidate for mediating the sex difference in aggression.

In Chapter Three, the role of risky impulsivity in same-sex aggression and sociosexuality, both of which are related to the pursuit of reproductive success in the face of risk, was examined. Results from this chapter indicate that risky impulsivity might represent a common proximate mechanism for individual differences in

aggression and sociosexuality, but that explaining sex differences in direct aggression requires consideration of processes at the dyadic, as well as the intrapsychic, level.

Finally, the reasons for the absence of a sex difference in intimate partner aggression were examined more closely in Chapter Four. Participants were asked about hypothetical responses to provocation by same-sex friends, opposite-sex friends, and partners. Self-report data were also gathered on participants' actual aggressive behaviour towards partners, same-sex friends and strangers, and opposite-sex friends and strangers. There was good concordance between vignette responses and self-reports. Results indicated that men's aggression is inhibited towards all female targets relative to male ones, but that women's aggression is disinhibited specifically towards partners. In other words, men's lowered aggression towards intimate partners is an effect of target sex, while women's raised aggression towards intimate partners is an effect of intimacy with the target.

It is argued that gender parity in intimate aggression is the result of sex-specific influences on rates of perpetration. It is further argued that any complete account of sex differences in aggression must be able to account for gender symmetry in aggression towards intimate partners. To this end, due consideration should be given to sex differences in low-level emotional and motivational processes, particularly fear, as well as the effects of sex differences in styles of anger expression. Specifically, men's reduction in intimate partner aggression might be best explained by the effects of Western social norms which proscribe aggression towards all women, while women's' raised intimate partner aggression might be best explained by an oxytocin-mediated reduction in fear which is specific to intimate partners.

CHAPTER ONE

Introduction

Boys are observed to be more physically aggressive than girls in the first two years of life (Baillargeon et al., 2007; Coté, Vaillancourt, Barker, Nagin, & Tremblay, 2007) and this difference between the sexes persists through childhood and adolescence (Card, Stucky, Sawalani, & Little, 2008). In adulthood, men commit homicide (Daly & Wilson, 1988, 1990) and criminal assault (Roe, Coleman, & Kaiza, 2009) more often than women do. Men report using physical and verbal aggression at a non-criminal level more than women (Archer, 2004). Men also use more aggression than women in experimental paradigms (Bettencourt & Miller, 1996).

Under certain circumstances, however, the sex difference in aggression becomes smaller, disappears, or reverses. In experimental studies, the sex difference in aggression is lessened by high levels of provocation or emotional arousal (Bettencourt & Miller, 1996; Knight, Guthrie, Page, & Fabes, 2002) or when interacting with a female target (Knight et al., 2002). In intimate partnerships, women use aggression against their partners as frequently as men do, if not more frequently (Archer, 2000a; Bethke & Dejoy, 1993; Milardo, 1998; Moffitt, Krueger, Caspi, & Fagan, 2000; Straus, 1999; Straus & Ramirez, 2007; Thornton, Graham-Kevan, & Archer, 2010).

Any complete theory explaining the sex difference in aggression must be able to account not only for the robust nature of sex differences in aggression in most circumstances, but their apparently plastic quality in others. This thesis explores the possibility that the sex difference in aggression is best explained by a sex difference in the willingness to tolerate risk, and that considering aggression from this perspective enables a better understanding of the sex difference in direct aggression and the factors that moderate it.

Sex Differences from an Evolutionary Perspective

Evolutionary approaches to sex differences in behaviour typically take as their starting point sex differences in parental investment, which is defined as “any investment by the parent in an individual offspring that increases the offspring’s chance of surviving (and hence reproductive success) at the cost of the parent’s ability to invest in other offspring.” (Trivers, 1972, p. 139) In any mammalian species, obligate parental investment (i.e. the amount of parental investment that is necessary to produce reproductively viable offspring) is much greater for females than for males: they bear the metabolic costs of producing larger sex cells, and of gestation and lactation. Because of the length of time required to rear an infant, the maximum number of offspring a woman can produce in a lifetime is heavily constrained (Ellison, 2001). The number of offspring a man can produce in a lifetime is constrained to a much smaller degree, since his obligate parental investment is much less.

The imbalance in parental investment makes females a limiting resource for males; men are more likely than women to die without producing any offspring at all (Salzano, Neel, & Mayburyl, 1967). Men therefore have a greater fitness variance than women on average (Brown, Laland, & Mulder, 2009), and their reproductive success is more closely linked than women’s to the number of partners they can secure (Jokela, Rotkirch, Rickard, Pettay, & Lummaac, 2010). This sex difference in reproductive fitness variance is believed to have a number of effects on the behaviour of sexually reproducing species, including humans. One of the major effects is that aggression between men should be more frequent and intense than aggression between women. This prediction, however, can be arrived at in one of two ways, each with slightly different implications. The first approach is to consider sex differences in aggression in terms of what males have to gain from aggressive competition, while the second focuses on what women stand to lose.

Male gains (Daly & Wilson, 1988). The first application of evolutionary principles to sex differences in human aggression was proposed by Daly and Wilson (1988) and runs as follows. Because men have greater fitness variance than women, and their reproductive success is more closely linked to the number of partners they can secure, they have more to gain by competing for mating opportunities. In other words: “Bigger prizes warrant bigger gambles” (p. 163). This intrasexual competition can, and frequently does, take the form of direct aggression between males (Daly & Wilson, 1988; Puts, 2010; Trivers, 1972). In other words, aggression is sexually selected in men (Archer, 2009; Puts, 2010). Because women’s reproductive fitness is constrained to a smaller number of offspring, they stand to gain little from pursuing mating opportunities with multiple partners (Jokela et al., 2010). They therefore do not compete with one another aggressively for mates in the way that men do.

Although humans show unusually large amounts of male parental investment compared to other primates and male choosiness when it comes to long-term mates (Geary, 2006), men’s parental investment is still more facultative and less obligate than women’s (Del Giudice, 2009), and humans still show characteristics of polygynous species (Archer, 2009). For example, humans are sexually dimorphic, with men having 61% more muscle mass than women (Lassek & Gaulin, 2009). The maintenance of such muscle mass is costly and results in earlier senescence and death, yet provides advantages in physical competition (Puts, 2010). This suggests that the sex difference in aggression is an adaptation resulting from effective polygyny over human prehistory.

Female losses (Campbell, 1999). A second evolutionary approach runs as follows (Campbell, 1999). The sex difference in direct aggression is the result not of what men have to gain from aggressive competition, but what women stand to lose. Although men have a greater fitness variance than women, this is of little relevance to competition between women. In fact, with the number of offspring varying so little between women, a single extra offspring represents a large increment in total fitness relative to a rival. Furthermore, the initial disparity in parental investment means that the loss of a single offspring represents a bigger loss or its mother than for its father. There is therefore a greater selection pressure operating on women than on men not to lose their initial investment for want of securing resources (Trivers, 1972).

In addition, although women are not expected to compete for a greater number of mating opportunities, there is reason for them to compete for the males who are most willing and able to provide long-term paternal investment. Resources such as food and protection from harassment are of great value when rearing a child. Women compete for these – and the men who can provide them – particularly when they are scarce (Campbell, 1995, 2004; Gaulin & Boster, 1990). Cross-cultural research on female-female aggression suggests that, when it does occur, it is frequently about men and access to men’s resources; when it is not, it is frequently in defence of or on behalf of offspring (Burbank, 1987). Furthermore, female-female aggression is highest in societies where resources are most scarce and women are most economically dependent on men (Campbell, 1995, 1999). Thus, although the resources for which men and women compete intrasexually differ, competition exists in both sexes as an adaptive response to resource shortage

Given that women have much to compete for and the potential benefits of successful competition are substantial, women's tendency to avoid direct aggression cannot be explained simply by the fact that they do not need to compete for large numbers of mates. Instead, it appears that women have been subject to selection pressure for safeguarding their bodies (Campbell, 1999). Because children are more dependent on their mothers than on their fathers, a mother's inclusive fitness is more tightly bound to her own survival. Fathers who die leave children whose chances of surviving to adulthood are impaired but not eradicated, due to the continued and high investment of the mother: For mothers who die there is a very severe danger to their reproductive output, particularly if they have children younger than two years (Sear & Mace, 2008). This means that the sex difference in direct aggression might be the result of selection pressure on women to avoid dangerous forms of competition.

Campbell (1999) proposes that women are more predisposed than men to preserve their own physical integrity and the psychological mechanism underlying this is a lower fear threshold in women than in men. Women are overrepresented among sufferers of phobias related to blood, medical procedures, or open or enclosed spaces (American Psychiatric Association, 1995), indicating a greater susceptibility to fear of bodily injury or attack. Women's levels of self-reported fear are higher than men's and remain so even when men's tendency to under-report fear is controlled using a 'bogus pipeline' technique in which respondents believe themselves to be attached to a lie-detector (Pierce & Kirkpatrick, 1992). This, along with women's higher anxiety on implicit tests (Egloff & Schmukle, 2004) and greater startle reactivity (Kofler, Muller, Reggiani, & Valls-Sole, 2001), indicates that the sex difference is genuine and not simply an effect of reporting bias.

Women actively safeguard their bodies more than men: they are significantly more likely than men to use seatbelts (U.S. Department of Transportation & National Highway Traffic Safety Administration, 2004) and more likely to visit their physicians for a given level of self-perceived health (Waldron, 1988). Women perceive the risk of becoming a victim of crime as being higher than men do (Smith & Torstensson, 1997), and have a greater fear than men of becoming the victims of person-directed (but not property-related) crime (Schafer, Huebner, & Bynum, 2006). With regard to involvement in aggression, women rate the danger of aggression as being higher than men do for any given level of involvement (Bettencourt & Miller, 1996) and report greater negative emotional responses following aggressive encounters (Graham & Wells, 2001). All of this suggests that women have a greater concern for and motivation to maintain their physical integrity than men do, and that this has an emotional basis.

Action vs. restraint: What's the mechanism? Both of the evolutionary approaches to sex differences in aggression discussed above deal with the weighting of the costs of action vs. restraint, and how this analysis differs for men and women. For men, access to willing mates is the limiting factor in reproductive success and aggression competition is a means of securing such access. The costs of restraint are weighted more heavily than the costs of action because while the potential costs of aggressive action are high, they are balanced by the certain costs of failing to secure a mate at all. For women, the costs of aggressive action are weighted more heavily than the costs of restraint because opportunities to mate are not a limiting factor in reproductive success: in terms of aggressive competition, restraint is unlikely to lead to reproductive death. Furthermore, the potential costs of aggressive action affect not only a woman's own life but those of any young offspring in which she might already have placed considerable investment.

To put it another way: for men, the biggest threat of reproductive death comes from a failure to mate, which can best be avoided by a tendency towards aggressive action. For women, the biggest risk of reproductive death comes from a loss of existing reproductive output, which can best be avoided by a tendency towards immediate restraint. One caveat should be noted. Although both of the above evolutionary accounts postulate relatively domain-general psychological mechanisms underlying a sex difference in tendency towards action or restraint, they do not imply a sex difference in all action vs. restraint decisions: Rather, sex differences should only be expected where there is an element of risk involved. Thus, women are not expected to be passive, inactive, or inert due to their greater tendency to avoid physical risk: Extant data show that women pursue competitive interests but in a manner which avoids the immediate physical danger posed by direct and/or physical aggression (Björkqvist, 1994; Campbell, 1999; Vaillancourt, 2005).

With regard to risky actions such as direct aggression, we should therefore expect to see the impelling forces urging action and the restraining forces counselling restraint reach different balance points in men and women. Daly and Wilson (1988) proposed a 'taste for risk' as the proximate psychological mechanism promoting a greater tendency towards action in men, while Campbell (1999) proposed fear as the mechanism causing a greater tendency towards restraint in women. A construct which, while distinct, has been related to both risk-taking

(Stanford, Greve, Boudreaux, Mathias, & Brumbelow, 1996) and fear (Rothbart & Bates, 1998) is *impulsivity*. Impulsivity has been suggested as a possible mechanism for sex differences in direct aggression (Campbell, 2006; Strüber, Luck, & Roth, 2008). Impulsivity is conceptualised and measured in a broad variety of ways, but there is a common thread uniting them: Whether it is thought of as a tendency to fail to control motor impulses (Logan, Schachar, & Tannock, 1997; Patton, Stanford, & Barratt, 1995), to act without planning (Carver, 2005; Whiteside & Lynam, 2001), to fail to resist cravings when under stress (Costa & McCrae, 1992), or to focus more on obtaining rewards in the present than waiting for opportunities for greater rewards in the future (Richards, Zhang, Mitchell, & de Wit, 1999), impulsivity is a tendency towards action over restraint. Chapters Two and Three explore in more detail the possibility that a sex difference in impulsivity might explain sex differences in aggression.

Summary of evolutionary approaches. The two evolutionary explanations of sex differences in aggression provide different but complementary accounts: Daly and Wilson's analysis focuses on why direct aggression between men is so high, while Campbell's focuses on why direct aggression between women is so low. Furthermore, the latter account suggests that it is risk of injury that causes the difference; forms of aggression low in risk might therefore be higher in women than forms that carry a high risk of injury. We now turn to different forms of aggression, which vary in risk, and examine the evidence for sex differences.

Sex Differences in Aggression: A Matter of Risk

Daly and Wilson (1988) concluded that, in the case of homicide, "The difference between the sexes is immense, and it is universal" (p. 146), while

Björkqvist (1994) argued that “it is incorrect, or rather, nonsensical, to claim that males are more aggressive than females” (p. 177). Such opposing conclusions appear to arise, at least partly, from differences in the definition and measurement of aggression. A complete discussion of the problems inherent in defining and measuring aggression could easily fill a thesis on its own and some of the questions –particularly with regard to intent– will be returned to in later chapters. What follows is a working definition, along with a brief discussion of some of the distinctions which have been drawn between different forms of aggression, with reference to their level of risk and sex differences therein.

Defining aggression. One of the most widely used definitions in the social psychological literature is: “any form of behaviour directed toward the goal of harming or injuring another living being who is motivated to avoid such treatment” (Baron & Richardson, 1994, p. 7). It is typically granted that ‘harm or injury’ also encompasses pain or distress: “So long as [the recipient] has experienced some type of aversive consequence, aggression has occurred” (Baron & Richardson, 1994, pp. 9-10). Acts which deliberately cause an experience of pain or distress are therefore aggressive.

Aggression is thus defined by the behaviour of the aggressor, the intention of the aggressor and the effect on the target (but see Buss, 1961, for a definition based only on behaviour and effect). While the first of these is directly observable, the second is an intrapsychic state which can only be inferred, and the third of these may also be unobservable, particularly in the case of psychological distress (Underwood, Galen, & Paquette, 2001). Therefore, the assessment of whether or not an act fulfils the criteria of aggression may differ between the aggressor, the target, and a third party observing the act. Much of the social psychological research on aggression operationalises aggression in terms of specific acts rather than attempting to measure intentions or effects. In contrast, research on violence – as opposed to aggression – focuses on the injurious consequences of aggressive acts. The distinction between acts and consequences will be returned to later in this chapter and in Chapter Four.

Direct and indirect aggression. A. H. Buss (1961) drew a distinction between direct and indirect aggression. This distinction refers to the possibility of the aggressor being immediately identified by the target. Direct aggression occurs in the presence of both perpetrator and target, which means that the aggressor is immediately identifiable and can be counter-attacked by the target. Indirect aggression is delivered without the perpetrator revealing him or herself to the target, which makes retaliation impracticable. Indeed, some definitions of indirect aggression refer specifically to the absence of awareness of the target that the actor has committed an aggressive act (Björkqvist, 1994; but see Archer & Coyne, 2005). For this reason, direct aggression carries a greater element of risk than indirect aggression.

Indirect aggression usually takes place via non-physical means and measures of indirect aggression typically include only non-physical items (Björkqvist, Osterman, & Kaukiainen, 1992; Campbell, Sapochnik, & Muncer, 1997; Green, Richardson, & Lago, 1996). A typical example of indirect aggression is the propagation of unfavourable rumours, judgements or accusations about the target. This form of aggression has also been referred to as relational or social aggression. The subtle differences and similarities between these terms are beyond the scope of this work (see Archer & Coyne, 2005, for a review), but they share an emphasis on non-physical means of causing distress or psychological harm, and hence represent similar, non-risky, strategies.

Campbell's (1999, 2004) evolutionary approach to aggression predicts that women will compete with one another but will prefer strategies that carry little or no physical risk. Bjorkqvist, Osterman, and Lagerspetz (1994) argue that women and girls use indirect aggression rather than direct aggression in order to maximise the effect/danger ratio: That is, to cause the biggest possible aversive effect to the target while minimising the risk of incurring injury. Consistent with these arguments, women and girls consistently use indirect aggression more frequently than they use direct aggression, while men and boys use them equally frequently or use direct aggression more (Björkqvist et al., 1992; Green et al., 1996; Richardson & Green, 1999). Björkqvist (1994) argues that the sex difference in aggression is one of type, not of degree. However, while men outscore women consistently on direct aggression, sex differences in the female direction in indirect aggression are neither pronounced nor consistent (see, e.g. Archer, 2004; Card et al., 2008; Green et al., 1996; Vaillancourt, 2005). Thus, although men and women do differ in their preferred strategies for competition, when indirect and direct aggression are both measured a sex difference in absolute rates of aggression still exists (Underwood et al., 2001).

Physical and verbal aggression. Although verbal and physical aggression are often measured separately (e.g. The Conflict Tactics Scale, Straus, 1996), some factor analyses suggest that verbal and minor physical aggression form a single dimension of direct aggression (Campbell et al., 1997; Lagerspetz, Bjorkqvist, & Peltonen, 1988). Verbal aggression temporally precedes physical aggression: While verbal aggression may frequently occur without physical aggression, physical aggression tends not to occur without verbal aggression (Felson & Steadman, 1983;

Stets, 1990). This, together with findings of a common genetic influence on both physical and verbal aggression (Coccaro, Bergeman, Kavoussi, & Seroczynski, 1997; Saudino & Hines, 2007), suggests that minor physical and verbal aggression are merely different parts of a single continuum (but see Stets, 1990). Threats of physical attack, having both a physical and a verbal component, are sometimes interpreted as physical aggression (e.g. Archer & Webb, 2006) and sometimes as verbal aggression (Straus, 1996).

When physical and verbal aggression are measured separately, men tend to outscore women more strongly on physical than verbal aggression (Archer, 2004; Bettencourt & Miller, 1996). Within the category of physical aggression, greater male than female involvement has remained robust over decades (Knight, Fabes, & Higgins, 1996; Knight et al., 2002) and is evident across different cultures (Archer, 2004; Daly & Wilson, 1988) The sex difference is most pronounced for the most extreme forms of aggression. It is consistently more marked for homicides than for assaults (U.S. Department of Justice, 2006, 2007, 2008, 2009). This further indicates that the sex difference in aggression is a function of the level of risk involved (Archer, 2009).

The Target Paradox: One Effect or Two?

The sex difference in direct aggression, despite being robust in other contexts, disappears or reverses in the case of partner aggression. This disappearance of the sex difference will be termed throughout this thesis as the 'target paradox.' A large-scale meta-analysis found an effect size of d = -0.05 for partner aggression (Archer, 2000a). This, although statistically significant, was extremely small in magnitude, suggesting that there are "typically no sex differences in overall acts of [partner] physical aggression" (Archer, 2009). More recent studies have also found gender symmetry in partner aggression (Forke, Myers, Catallozzi, & Schwarz, 2008; Robertson & Murachver, 2007; Straus & Ramirez, 2007).

Equally aggressive does not mean equally violent. Despite calls for the terms aggression and violence not to be used interchangeably (Archer, 1994, 2000a, 2000b), data showing gender-equal rates of intimate partner aggression are interpreted by some researchers as a claim that men and women are "equally violent in relationships" (White, Smith, Koss, & Figueredo, 2000, p. 694). Refutations of this claim generally cite evidence from injury and death rates (Dobash, Dobash, Wilson, & Daly, 1992): Women are more likely to be injured (Archer, 2000a) or killed (Daly & Wilson, 1988) by their partners than men are. However, women's higher rates of injury do not imply that women are the less frequent aggressors; these might be the product of a sex difference in size and strength rather than a sex difference in the use of aggressive acts. Not only do men have a considerable upper-body strength advantage over women (Lassek & Gaulin, 2009), but assortative mating by height (see, e.g., Silventoinen, Kaprio, Lahelma, Viken, & Rose, 2003) means that smaller-than-average men will tend to choose smaller-than-average women as long-term partners, while larger-than-average women seek larger-than-average men. The male advantage in size and strength is therefore a relatively constant feature of heterosexual pairings (Anderson, 2005). The findings of gender parity in aggressive acts and of gender asymmetry in injuries are therefore not incompatible with one another, but careful use of terminology is necessary to avoid confusion.

Gender-equal does not mean gender-free. The absence of a sex difference in partner aggression might be taken to suggest that there is less to explain with regard to sex differences in partner aggression than with regard to sex differences in aggression more generally. For example, in a recent review, Archer (2009) concluded “there are no appreciable sex differences in physical aggression to opposite-sex partners, and therefore there is no need to look for ultimate explanations or for mediators” (p. 263). However, others have suggested that this conclusion is not warranted and that sex-equal rates of partner aggression might result from sex-specific psychological processes (Finkel & Slotter, 2009). The robust sex difference in aggression towards targets other than partners suggests that men and women approach their roughly equal rates of partner aggression from different starting points, which suggests in turn that the processes determining levels of partner aggression (relative to general aggression) might differ between the sexes (Cross, 2005). Chapter Four of this thesis examines whether men lower their levels of aggression, whether women raise theirs, or whether both of these processes are happening.

Aims of the Thesis

The first two papers in this thesis are concerned with establishing sex differences in impulsivity as a potential proximate mechanism for sex differences in aggression. Although impulsivity has been explored as an explanatory variable for aggressive behaviour (Vigil-Colet, Morales-Vives, & Tous, 2008), and has been suggested as a mechanism for sex differences in direct aggression (Campbell, 2006; Strüber et al., 2008), defining and measuring impulsivity presents conceptual and methodological difficulties and reports of sex differences in impulsivity have been inconsistent. In Chapter Two, therefore, various psychometric and behavioural measures of impulsivity are meta-analysed to establish which forms of impulsivity measurement produce consistent sex differences. In Chapter Three, a relatively new measure of impulsivity –risky impulsivity– is evaluated as a predictor of direct aggression. Furthermore, links between direct aggression, risky impulsivity, and sociosexuality – a tendency towards promiscuous sexual behaviour – are explored. Sociosexuality, like aggression, is a form of behaviour for which the action/restraint trade-off differs for men and women, and in Chapter Three I argue that the two forms of behaviour might share a common proximate mechanism.

Chapter Four is concerned with the reasons why the sex difference in direct aggression disappears or reverses in the context of intimate relationships. Although this finding is well established, the reasons for it are unclear. Most studies compare partner aggression with aggression towards an unspecified same-sex other, which leaves open the question of whether aggression towards partners differ from those towards other targets because of the partner's sex, because of the intimate nature of the partner relationship, or both. In Chapter Four, hypothetical vignette scenarios are used to examine separately the effects of target sex and intimacy with the target on the likelihood of using aggression. It is suggested that a single mechanism underlying both direct aggression and sexual behaviour might account not only for sex differences in these two behaviours generally but for raised levels of female aggression when the target is an intimate partner.

Finally, Chapter Five considers possible genetic and neuronal underpinnings of individual differences in impulsivity, as well as future directions for work in this area, particularly examining the role of cultural norms on men's intimate partner aggression, and the role of fear in women's intimate partner aggression.

References

American Psychiatric Association. (1995). *Diagnostic and statistical manual of mental disorders: DSM-IV*. Washington, DC American Psychiatric Association.

Anderson, K. L. (2005). Theorizing gender in intimate partner violence research. *Sex Roles, 52*, 853-865. 10.1007/s11199-005-4204-x.

Archer, J. (1994). Introduction. In J. Archer (Ed.), *Male violence* (pp. 1-20). London: Routledge.

Archer, J. (2000a). Sex differences in aggression between heterosexual partners: A meta-analytic review. *Psychological Bulletin, 126*, 651-680. doi:10.1037/0033-2909.126.5.651.

Archer, J. (2000b). Sex differences in physical aggression to partners: A reply to Frieze (2000), O'Leary (2000), and White, Smith, Koss, and Figueredo (2000). *Psychological Bulletin, 126*, 697-702. doi:10.1037/0033-2909.126.5.697.

Archer, J. (2004). Sex differences in aggression in real-world settings: A meta-analytic review. *Review of General Psychology, 8*, 291-322. doi:10.1037/1089-2680.8.4.291.

Archer, J. (2009). Does sexual selection explain human sex differences in aggression? *Behavioral and Brain Sciences, 32*, 249-310. 10.1017/s0140525x09990951.

Archer, J., & Coyne, S. M. (2005). An integrated review of indirect, relational, and social aggression. *Personality and Social Psychology Review, 9*, 212-230. doi:10.1207/s15327957pspr0903_2.

Archer, J., & Webb, I. A. (2006). The relation between scores on the Buss-Perry Aggression Questionnaire and aggressive acts, impulsiveness, competitiveness, dominance, and sexual jealousy. *Aggressive Behavior, 32*, 464-473. doi:10.1002/ab.20146.

Baillargeon, R. H., Zoccolillo, M., Keenan, K., Cote, S., Perusse, D., Wu, H. X., et al. (2007). Gender differences in physical aggression: A prospective population-based survey of children before and after 2 years of age. *Developmental Psychology, 43*, 13-26. 10.1037/0012-1649.43.1.13.

Baron, R. A., & Richardson, D. R. (1994). *Human aggression* (2nd ed.). New York: Plenum Press.

Bethke, T. M., & Dejoy, D. M. (1993). An experimental-study of factors influencing the acceptability of dating violence. *Journal of Interpersonal Violence, 8*, 36-51. doi:10.1177/088626093008001003.

Bettencourt, B. A., & Miller, N. (1996). Gender differences in aggression as a function of provocation: A meta-analysis. *Psychological Bulletin, 119*, 422-447. doi:10.1037/0033-2909.119.3.422.

Björkqvist, K. (1994). Sex differences in physical, verbal, and indirect aggression: A review of recent research. *Sex Roles, 30*, 177-188. doi:10.1007/BF01420988.

Björkqvist, K., Osterman, K., & Kaukiainen, A. (1992). The development of direct and indirect aggressive strategies in males and females. In K. Björkqvist & P. Niemela (Eds.), *Of mice and women: Aspects of female aggression*. San Diego, CA: Academic Press.

Bjorkqvist, K., Osterman, K., & Lagerspetz, K. M. J. (1994). Sex differences in covert aggression among adults. *Aggressive Behavior, 20*, 27-33.

Brown, G. R., Laland, K. N., & Mulder, M. B. (2009). Bateman's principles and human sex roles. *Trends in Ecology & Evolution, 24*, 297-304. 10.1016/j.tree.2009.02.005.

Burbank, V. K. (1987). Female aggression in cross-cultural perspective. *Cross-Cultural Research, 21*, 70-100. doi:10.1177/106939718702100103.

Buss, A. H. (1961). *The Psychology of Aggression*. New York: Wiley. doi:10.1037/11160-000.

Campbell, A. (1995). A few good men: Evolutionary psychology and female adolescent aggression. *Ethology and Sociobiology, 16*, 99-123.

Campbell, A. (1999). Staying alive: Evolution, culture, and women's intrasexual aggression. *Behavioral and Brain Sciences, 22*, 203-214+. doi:10.1017/S0140525X99001818.

Campbell, A. (2004). Female competition: Causes, constraints, content, and contexts. *Journal of Sex Research, 41*, 16-26. doi:10.1080/00224490409552210.

Campbell, A. (2006). Sex differences in direct aggression: What are the psychological mediators? *Aggression and Violent Behavior, 11*, 237-264. doi:10.1016/j.avb.2005.09.002.

Campbell, A., Sapochnik, M., & Muncer, S. (1997). Sex differences in aggression: Does social representation mediate form of aggression? *British Journal of Social Psychology, 36*, 161-171.

Card, N. A., Stucky, B. D., Sawalani, G. M., & Little, T. D. (2008). Direct and indirect aggression during childhood and adolescence: A meta-analytic review of gender differences, intercorrelations, and relations to maladjustment. *Child Development, 79*, 1185-1229. doi:10.1111/j.1467-8624.2008.01184.x.

Carver, C. S. (2005). Impulse and constraint: Perspectives from personality psychology, convergence with theory in other areas, and potential for integration. *Personality and Social Psychology Review, 9*, 312-333. doi:10.1207/s15327957pspr0904_2.

Coccaro, E. F., Bergeman, C. S., Kavoussi, R. J., & Seroczynski, A. D. (1997). Heritability of aggression and irritability: A twin study of the Buss-Durkee aggression scales in adult male subjects. *Biological Psychiatry, 41*, 273-284. doi:10.1016/S0006-3223(96)00257-0.

Costa, P. T., & McCrae, R. R. (1992). *Revised NEO Personality Inventory (NEO PI-R) and NEO Five Factor Inventory (NEO-FFI): Professional manual*. Odessa, FL: Psychological Assessment Resources.

Coté, S. M., Vaillancourt, T., Barker, E. D., Nagin, D., & Tremblay, R. E. (2007). The joint development of physical and indirect aggression: Predictors of continuity and change during childhood. *Development and Psychopathology, 19*, 37-55. doi:10.1017/S0954579407070034.

Cross, C. P. (2005). *Setting the bar: Gender-specific factors influencing rates of intimate partner aggression. .* Unpublished dissertation, Durham University.

Daly, M., & Wilson, M. (1988). *Homicide*. New York: Aldine de Gruyter.

Daly, M., & Wilson, M. (1990). Killing the competition. *Human Nature, 1*, 81-107. 10.1007/BF02692147.

Del Giudice, M. (2009). Human reproductive strategies: An emerging synthesis? *Behavioral and Brain Sciences, 32*, 45-67. 10.1017/s0140525x09000272.

Dobash, R. P., Dobash, R. E., Wilson, M., & Daly, M. (1992). The myth of sexual symmetry in marital violence. *Social Problems, 39*, 71-91. doi:10.1525/sp.1992.39.1.03x0064l.

Egloff, B., & Schmukle, S. C. (2004). Gender differences in implicit and explicit anxiety measures. *Personality and Individual Differences, 36*, 1807-1815. 10.1016/j.paid.2003.07.002.

Ellison, P. T. (2001). *On fertile ground*. Cambridge, Mass. ; London: Harvard University Press.

Felson, R. B., & Steadman, H. J. (1983). Situational factors in disputes leading to criminal violence. *Criminology, 21*, 59-74. doi:10.1111/j.1745-9125.1983.tb00251.x.

Finkel, E. J., & Slotter, E. B. (2009). An I-3 Theory analysis of human sex differences in aggression. *Behavioral and Brain Sciences, 32*, 279-+. 10.1017/s0140525x09990410.

Forke, C. M., Myers, R. K., Catallozzi, M., & Schwarz, D. F. (2008). Relationship violence among female and male college undergraduate students. *Archives of Pediatrics & Adolescent Medicine, 162*, 634-641. doi:10.1001/archpedi.162.7.634.

Gaulin, S. J. C., & Boster, J. S. (1990). Dowry as female competition. *American Anthropologist, 92*, 994-1005. doi:10.1525/aa.1990.92.4.02a00080.

Geary, D. C. (2006). Sex differences in social behavior and cognition: Utility of sexual selection for hypothesis generation. *Hormones and Behavior, 49*, 273-275. 10.1016/j.yhbeh.2005.07.014.

Graham, K., & Wells, S. (2001). The two worlds of aggression for men and women. *Sex Roles, 45*, 595-622.

Green, L. R., Richardson, D. R., & Lago, T. (1996). How do friendship, indirect, and direct aggression relate? *Aggressive Behavior, 22*, 81-86. doi:10.1002/(SICI)1098-2337(1996)22:2<81::AID-AB1>3.3.CO;2-P.

Jokela, M., Rotkirch, A., Rickard, I. J., Pettay, J., & Lummaac, V. (2010). Serial monogamy increases reproductive success in men but not in women. *Behavioral Ecology, 21*, 906-912. doi:10.1093/beheco/arq078.

Knight, G. P., Fabes, R. A., & Higgins, D. A. (1996). Concerns about drawing causal inferences from meta-analyses: An example in the study of gender differences in aggression. *Psychological Bulletin, 119*, 410-421. doi:10.1037/0033-2909.119.3.410.

Knight, G. P., Guthrie, I. K., Page, M. C., & Fabes, R. A. (2002). Emotional arousal and gender differences in aggression: A meta-analysis. *Aggressive Behavior, 28*, 366-393. doi:10.1002/ab.80011.

Kofler, M., Muller, J., Reggiani, L., & Valls-Sole, J. (2001). Influence of gender on auditory startle responses. *Brain Research, 921*, 206-210. doi:10.1016/S0006-8993(01)03120-1.

Lagerspetz, K. M. J., Bjorkqvist, K., & Peltonen, T. (1988). Is indirect aggression typical of females? Gender differences in aggressiveness in 11- to 12-year-old children. *Aggressive Behavior, 14*, 403-414. doi:10.1002/1098-2337(1988)14:6<403::AID-AB2480140602>3.0.CO;2-D.

Lassek, W. D., & Gaulin, S. J. C. (2009). Costs and benefits of fat-free muscle mass in men: relationship to mating success, dietary requirements, and native immunity. *Evolution and Human Behavior, 30*, 322-328. 10.1016/j.evolhumbehav.2009.04.002.

Logan, G. D., Schachar, R. J., & Tannock, R. (1997). Impulsivity and inhibitory control. *Psychological Science, 8*, 60-64.

Milardo, R. M. (1998). Gender asymmetry in common couple violence. *Personal Relationships, 5*, 423-438. doi:10.1111/j.1475-6811.1998.tb00180.x.

Moffitt, T. E., Krueger, R. F., Caspi, A., & Fagan, J. (2000). Partner abuse and general crime: How are they the same? How are they different? *Criminology, 38*, 199-232. doi:10.1111/j.1745-9125.2000.tb00888.x.

Patton, J. H., Stanford, M. S., & Barratt, E. S. (1995). Factor structure of the Barratt Impulsiveness Scale. *Journal of Clinical Psychology, 51*, 768-774. doi:10.1002/1097-4679(199511)51:6<768::AID-JCLP2270510607>3.0.CO;2-1.

Pierce, K. A., & Kirkpatrick, D. R. (1992). Do men lie on fear surveys? *Behaviour Research and Therapy, 30*, 415-418. doi:10.1016/0005-7967(92)90055-L.

Puts, D. A. (2010). Beauty and the beast: Mechanisms of sexual selection in humans. *Evolution and Human Behavior, 31*, 157-175. 10.1016/j.evolhumbehav.2010.02.005.

Richards, J. B., Zhang, L., Mitchell, S. H., & de Wit, H. (1999). Delay or probability discounting in a model of impulsive behavior: Effect of alcohol. *Journal of the*

Experimental Analysis of Behavior, 71, 121-143. doi:10.1901/jeab.1999.71-121.

Richardson, D. R., & Green, L. R. (1999). Social sanction and threat explanations of gender effects on direct and indirect aggression. *Aggressive Behavior, 25*, 425-434. doi:10.1002/(SICI)1098-2337(1999)25:6<425::AID-AB3>3.0.CO;2-W.

Robertson, K., & Murachver, T. (2007). It takes two to tangle: Gender symmetry in intimate partner violence. *Basic and Applied Social Psychology, 29*, 109-118.

Roe, S., Coleman, K., & Kaiza, P. (2009). Violent and sexual crime. In A. Walker, J. Flatley, C. Kershaw & D. Moon (Eds.), *Crime in England and Wales 2008/09* (pp. 43-72): Home Office Statistical Bulletin 11/09. London: Home Office.

Rothbart, M. K., & Bates, J. E. (1998). Temperament. In W. Damon & N. Eisenberg (Eds.), *Handbook of child psychology. Social, emotional and personality development, Vol. 3.* (pp. 105– 176). Chichester: Wiley.

Salzano, F. M., Neel, J. V., & Mayburyl, D. (1967). Further studies on Xavante Indians. I. Demographic data on 2 additional villages: Genetic structure of the tribe. *American Journal of Human Genetics, 19*, 463-&.

Saudino, K., & Hines, D. (2007). Etiological similarities between psychological and physical aggression in intimate relationships: A behavioral genetic exploration. *Journal of Family Violence, 22*, 121-129. doi:10.1007/s10896-006-9059-6.

Schafer, J. A., Huebner, B. M., & Bynum, T. S. (2006). Fear of crime and criminal victimization: Gender-based contrasts. *Journal of Criminal Justice, 34*, 285-301. 10.1016/j.jcrimjus.2006.03.03.

Sear, R., & Mace, R. (2008). Who keeps children alive? A review of the effects of kin on child survival. *Evolution and Human Behavior, 29*, 1-18.

Silventoinen, K., Kaprio, J., Lahelma, E., Viken, R. J., & Rose, R. J. (2003). Assortative mating by body height and BMI: Finnish twins and their spouses. *American Journal of Human Biology, 15*, 620-627. 10.1002/ajhb.10183.

Smith, W. R., & Torstensson, M. (1997). Gender differences in risk perception and neutralizing fear of crime: Toward resolving the paradoxes. *British Journal of Criminology, 37*, 608-634.

Stanford, M. S., Greve, K. W., Boudreaux, J. K., Mathias, C. W., & Brumbelow, J. L. (1996). Impulsiveness and risk-taking behavior: Comparison of high-school and college students using the Barratt Impulsiveness Scale. *Personality and Individual Differences, 21*, 1073-1075.

Stets, J. E. (1990). Verbal and physical aggression in marriage. *Journal of Marriage and the Family, 52*, 501-514. doi:10.2307/353043.

Straus, M. A. (1996). The Revised Conflict Tactics Scales (CTS2): Development and preliminary psychometric data. *Journal of Family Issues, 17*, 283-316. doi:10.1177/019251396017003001.

Straus, M. A. (1999). The controversy over domestic violence by women: A methodological, theoretical, and sociology of science analysis. In X. B. Arriaga & S. Oskamp (Eds.), *Violence in intimate relationships* (pp. vii, 216): Thousand Oaks, CA, US: Sage Publications, Inc.

Straus, M. A., & Ramirez, I. L. (2007). Gender symmetry in prevalence, severity, and chronicity of physical aggression against dating partners by university students in Mexico and USA. *Aggressive Behavior, 33*, 281-290. 10.1002/ab.20199.

Strüber, D., Luck, M., & Roth, G. (2008). Sex, aggression and impulse control: An integrative account. *Neurocase, 14*, 93-121. 10.1080/13554790801992743.

Thornton, A. J. V., Graham-Kevan, N., & Archer, J. (2010). Adaptive and maladaptive personality traits as predictors of violent and nonviolent offending behavior in men and women. *Aggressive Behavior, 36*, 177-186. 10.1002/ab.20340.

Trivers, R. (1972). Parental investment and sexual selection. In B. Campbell (Ed.), *Sexual selection and the descent of man*: Aldine de Gruyter.

U.S. Department of Justice. (2006). *Murder offenders by age, sex, and race, 2005*. Retrieved 8th June, 2010, from http://www.fbi.gov/ucr/05cius/data/table_42.html

U.S. Department of Justice. (2007). *Murder offenders by age, sex, and race, 2006*. Retrieved 8th June, 2010, from http://www.fbi.gov/ucr/cius2006/offenses/expanded_information/data/shrtable_03.html

U.S. Department of Justice. (2008). *Murder offenders by age, sex, and race, 2007*. Retrieved 8th June, 2010, from http://www.fbi.gov/ucr/cius2007/offenses/expanded_information/data/shrtable_03.html

U.S. Department of Justice. (2009). *Murder offenders by age, sex, and race, 2008*. Retrieved 8th June, 2010, from http://www.fbi.gov/ucr/cius2008/offenses/expanded_information/data/shrtable_03.html

U.S. Department of Transportation, & National Highway Traffic Safety Administration. (2004). *Safetly belt use in 2003: Demographic characteristics* (Report No. DOT HS 809 729). Retrieved from http://www-nrd.nhtsa.dot.gov/Pubs/809729.PDF.

Underwood, M. K., Galen, B. R., & Paquette, J. A. (2001). Top ten challenges for understanding gender and aggression in children: Why can't we all just get along? *Social Development, 10*, 248-266. doi:10.1111/1467-9507.00162.

Vaillancourt, T. (2005). Indirect aggression among humans: Social construct or evolutionary adaptation? In R. E. Tremblay, W. W. Hartup & J. Archer (Eds.), *Developmental Origins of Aggression* (pp. 158-177). New York: The Guilford Press.

Vigil-Colet, A., Morales-Vives, F., & Tous, J. (2008). The Relationships between functional and dysfunctional impulsivity and aggression across different samples. *Spanish Journal of Psychology, 11*, 480-487.

Waldron, I. (1988). Gender and health-related behavior. In D. S. Gochman (Ed.), *Health behavior: Emerging research perspectives*. New York: Plenum Press.

White, J. W., Smith, P. H., Koss, M. P., & Figueredo, A. J. (2000). Intimate partner aggression: What have we learned? Comment on Archer (2000). *Psychological Bulletin, 126*, 690-696. 10.1037//0033-2909.126.5.690.

Whiteside, S. P., & Lynam, D. R. (2001). The Five Factor Model and impulsivity: using a structural model of personality to understand impulsivity. *Personality and Individual Differences, 30*, 669-689. doi:10.1016/S0191-8869(00)00064-7.

CHAPTER TWO

Are There Sex Differences in Impulsivity?

As stated in the Introduction, impulsivity has been investigated as a predictor of aggressive behaviour and has been suggested as a mediator of the sex difference in direct aggression (Campbell, 2006; Strüber, Luck, & Roth, 2008). It is therefore important to address the question of whether there are sex differences in impulsivity. If there are none, then it is unlikely to mediate sex differences in aggression. Sex differences have been reported in neural sites believed to underlie emotion regulation (Gur, Gunning-Dixon, Bilker, & Gur, 2002; Meyer-Lindenberg et al., 2006), and sensation seeking measures show reliable sex differences (Zuckerman, 1994), but norms for several psychometric measures of trait impulsivity show no sex differences (Eysenck, Pearson, Easting, & Allsopp, 1985; Stanford et al., 2009; Whiteside & Lynam, 2001).

The question of whether or not there are sex differences in impulsivity is complicated by the fact that impulsivity is conceptualised and measured in a broad variety of ways. It may be viewed as an oversensitivity to reward which leads to poorly-planned appetitive action; or as a failure to respond to signals of impending non-reward or punishment which means that actions are not appropriately restrained. These conceptualisations of impulsivity refer to low-level psychological processes predicated on affective responses to reward or punishment. In contrast, impulsivity may be viewed in terms of executive function. In this view, impulsive individuals are those who cannot or do not override prepotent responses, and this lack of executive control is what leads to poorly planned actions.

Some forms of impulsivity are more strongly implicated in aggressive behaviour than others. A review by Campbell (2006) suggests that cognitive forms of impulsivity are less likely candidates for explaining sex differences in aggression than more affective forms. For example, White et al (1994) examined various behavioural measures of impulsivity and found that those related to the control of motor behaviour correlated more strongly with delinquency than those measuring cognitive impulsivity. Lynam and Miller (2004) examined different facets of psychometrically measured impulsivity and found that lack of premeditation and sensation seeking predicted conduct problems (including fighting), whereas lack of perseverance and urgency did not. Furthermore, scores on the Aggression Questionnaire–Refined (AQ-R, Gallardo-Pujol, Krarnp, Garcia-Forero, Perez-Ramirez, & Andres-Pueyo, 2006) are more strongly correlated with the non-planning impulsiveness subscale of the Barratt Impulsiveness Scale than with the motor impulsiveness and cognitive impulsiveness subscales (Garcia-Forero, Gallardo-Pujol, Maydeu-Olivares, & Andres-Pueyo, 2009). These analyses suggest that a lack of planning is more important than cognitive impulsivity in determining levels of aggression but, because the impulsivity measures used differ, they are difficult to compare directly.

The purpose of the following meta-analysis within the context of this thesis was to establish which forms of impulsivity measurement were most likely to be appropriate for explaining sex differences in aggression, by examining the magnitude and consistency of sex differences in psychometric and behavioural measures of impulsivity. It has been noted before that the term ‘impulsivity’ encompasses a wide variety of facets (Depue & Collins, 1999), and that there is a lack of consensus on exactly how many facets there are and which of them are conceptually important

(Evenden, 1999). The review therefore aimed to capture as broad a range of impulsivity measures as possible. It was anticipated that measures relating to sensation seeking or risk taking would show sex differences in the male direction, and measures relating to cognitive or non-risky forms of impulsivity would show no sex differences.

Sex Differences in Impulsivity: A Meta-Analysis

Psychological Bulletin, 137, 97-130 (2011)

Catharine P. Cross, Lee T. Copping and Anne Campbell

Durham University

Abstract

Men are over-represented in socially problematic behaviours, such as aggression and criminal behaviour, which have been linked to impulsivity. We organise our review of impulsivity around the tripartite theoretical distinction between reward hypersensitivity, punishment hyposensitivity, and inadequate effortful control. Drawing on evolutionary, criminological, developmental, and personality theories, we predicted that sex differences would be most pronounced in risky activities with men demonstrating greater sensation seeking, greater reward sensitivity and lower punishment sensitivity. We predicted a small female advantage in effortful control. We analysed 741 effect sizes from 277 studies, including psychometric and behavioural measures. Women were consistently more punishment sensitive (d = -0.33), but men did not show greater reward sensitivity (d = 0.01). Men showed significantly higher sensation seeking on questionnaire measures (d = 0.41) and on a behavioural risk taking task (d = 0.36). Questionnaire measures of deficits in effortful control showed a very modest effect size in the male direction (d = 0.08). Sex differences were not found on delay discounting or executive function tasks. The results indicate a stronger sex difference in motivational rather than effortful or executive forms of behaviour control. Specifically, they support evolutionary and biological theories of risk taking predicated on sex differences in punishment sensitivity. A clearer understanding of sex differences in impulsivity depends upon recognizing important distinctions between sensation seeking and impulsivity, between executive and effortful forms of control, and between impulsivity as a deficit and as a trait.

Men engage in impulsive and risky behaviours more frequently than women. They die younger than women, and the higher male: female mortality ratio is particularly pronounced for deaths from external causes (Kruger & Nesse, 2006). Men drive more recklessly with fully 97 percent of dangerous driving offences committed by men (Beattie, 2008; Norris, Matthews & Riad, 2000). Men also have a significantly higher death rate from non-vehicle accidents such as falls, drowning, choking, electrocution, firearm accidents, and fires (Pampel, 2001). Violence-precipitated visits to hospital accident and emergency services are higher among men (Shepherd, 1990). Men are more physically and verbally aggressive than women across data sources and nations (Archer, 2004, 2009; Bettencourt & Miller, 1996; Eagly & Steffen, 1986; Hyde, 1986; Knight, Fabes & Higgins, 1996; Knight, Guthrie, Page & Fabes, 2002). Men constitute 76 percent of all criminal arrests in the United States, committing 89 percent of homicides and 82 percent of all violent crime (US Department of Justice, n.d.). Worldwide, men use drugs (alcohol, tobacco, cannabis and cocaine) more than women (Degenhardt et al., 2008). They participate more often in extreme sports, such as sky diving and mountain climbing (Harris, Jenkins & Glaser, 2006; Robinson, 2008). Men are also more likely than women to suffer from a range of psychopathologies characterized by externalizing and impulsive behaviours such as antisocial personality disorder, conduct disorder, attention deficit hyperactivity disorder, and intermittent explosive disorder (American Psychiatric Association, 2000; Frank, 2000; Gershon & Gershon, 2002; Kessler et al., 2006; Moffitt, Caspi & Rutter, 2001).

In all of these domains, impulsivity has been invoked as an explanatory variable. Sometimes impulsivity is embedded in a theory or model, but more often it appears as an independent variable in regression analyses along with other plausible explanatory candidates. It is surprisingly rare, however, that sex differences in social and psychological pathologies have been considered in relation to sex differences in impulsivity in society at large. In the present study, we use meta-analysis to examine whether there are sex differences in unselected community samples across a range of psychometric and behavioural measures of impulsivity. We also examine whether, in these samples, variance in men's impulsivity scores is greater than women's. Such a finding could explain men's over-representation in extreme and problematic impulsive behaviours. Indeed, although men would also be over-represented at the left as well as the right tail of the distribution, low levels of impulsivity are unlikely to attract attention from educational, medical or judicial systems.

Impulsivity: Models, Measures, and Sex Differences

A terse, broad, and widely-accepted definition of impulsivity is a "tendency to act spontaneously and without deliberation" (Carver, 2005, p. 313). However, the trait is far from unitary, and Depue and Collins (1999, p.495) note that "impulsivity comprises a heterogeneous cluster of lower-order traits". There have been a bewildering number of attempts to disaggregate impulsivity into more specific subtypes such as failure to plan (Patton, Stanford & Barratt, 1995), lack of perseverance (Whiteside & Lynam, 2001), venturesomeness (Eysenck & Eysenck, 1985), poor self-discipline (Costa & McCrae, 1992), and novelty seeking (Cloninger, 1987).

In organising our review of the literature, we focus on theoretical approaches to impulsivity highlighting the extent to which they emphasize over-attraction to reward (strong approach motivation), under-sensitivity to punishment (weak avoidance motivation), or problems with effortful or higher-order control. In an automotive analogy, these can be thought of as a problem with a stuck accelerator, a problem of faulty brakes, or a problem of poor judgment by the driver. Many theoretical approaches to impulsivity explicitly invoke this distinction between approach, avoidance, and higher-order cognitive systems (Carver 2005; Cloninger, 1987*;* Depue & Collins, 1999; Fowles, 1987; Gray, 1982; Nigg, 2001; Rothbart, Ahadi & Evans, 2000). This tripartite distinction also dovetails with proposals made by evolutionary, developmental, personality, criminological, and clinical psychologists about the source of sex differences in impulsivity. In this brief overview, we describe the various theoretical orientations and formulate predictions of likely sex differences. We also note measures that have been developed to assess the constructs that are included in our meta-analysis. These are summarized in Table 1. Some theorists have been explicit in their recognition and explanation of sex differences in impulsivity. In other cases, we have inferred sex differences via theorists' proposed explanations of psychopathologies that are more prevalent in one sex than the other.

Reward Sensitivity and Approach Motivation

Evolutionary theory. Aggressive behaviour, as we have noted, is considerably more frequent and serious among men. Evolutionary approaches have been quite explicit in their predictions of sex differences in aggression. Across many species including our own, asymmetries of parental investment exert a significant impact on those aspects of psychology that have consequences for inclusive fitness. To the extent that effective polygyny was characteristic of hominid evolution (Archer, 2009; Larsen, 2003; Plavcan, 2001), men have had very high incentives for establishing intra-sexual dominance as a means of securing a large number of mates and increasing their reproductive success (Daly & Wilson, 1983). This competition can take the form of direct aggression, with correspondingly increased rates of homicide and decreased life expectancy, especially among men who are young and unmarried (Daly & Wilson, 1988; Wilson & Daly, 1997). Wilson and Daly (1985) suggested that the psychological mechanism underlying this male-on-male aggression is an increased ‘taste for risk’ among young men, a taste that also manifests itself in riskier decision-making, gambling, dangerous driving, and drug use. This formulation suggests that sex differences should be most marked in those impulsivity measures that include a component of sensation seeking or risk taking. In emphasizing the appetitive nature of motivation (i.e., the positive attractions of risk), this model also predicts sex differences in the sensitivity to reward associated with such risky enterprises.

Sensation seeking. Zuckerman’s (1979, p. 10) definition of sensation seeking as "the need for varied, novel, and complex sensations and experiences and the willingness to take physical and social risks for the sake of such experience" highlights the compelling attraction of novel experiences – an attraction of such intensity that the individual is willing to tolerate risks in their pursuit. Zuckerman and Kuhlman (2000, p. 1001) argue that “The approach gradient is higher and the avoidance gradient (anticipated anxiety) is lower in high sensation seekers than in low sensation seekers over the range of novel risk taking activities.” Sex differences have been found consistently on Zuckerman’s Sensation Seeking Scale (SSS-V) (Zuckerman, 1994). These appear on the Thrill and Adventure, Boredom Susceptibility, and Disinhibition subscales but are absent on the Experience Seeking subscale, which measures preferences for new experiences that are not marked by risk (e.g., eating exotic food). A newer measure, the Impulsive Sensation Seeking (ImpSS) scale of the Zuckerman Kuhlman Personality Questionnaire (ZKPQ), also shows sex differences, with men scoring higher (McDaniel & Zuckerman, 2003; Zuckerman, Kuhlman, Joireman, Teta & Kraft, 1993). Sex differences in a range of risky behaviours were found to be completely mediated by the sex difference in ImpSS (Zuckerman & Kuhlman, 2000).

Zuckerman (1989, 1994, 2006) has suggested that men's role in mate competition and hunting is the distal factor driving this desire for risk. Testosterone levels are correlated with sensation seeking, as well as with prioritization of short-term goals, impulsivity, dominance, competition and sexual arousal (Archer, 2006). In terms of central nervous system action, ImpSS is proposed to result from the balance between the attraction of excitement and the avoidance of danger associated specifically with risky behaviours. The explanatory approach is biological: dopamine is involved in reward and approach behaviour, while serotonin mediates restraint. Dopamine accelerates risky behaviour because, when faced with danger, high sensation seekers experience stronger attraction than low sensation-seekers. Men's greater sensation seeking chiefly results from a more reactive dopaminergic system (Zuckerman & Kuhlman, 2000). Zuckerman also acknowledges the relevance of inhibition mediated by the serotonergic system, but his chief emphasis is on the attractions of risk taking among men.

Criminology. In their General Theory of Crime, Gottfredson and Hirschi (1990) argued that the attractions of antisocial behaviour are powerful, immediate, and evident. It is criminal desistance rather than involvement that requires explanation. They proposed that criminal behaviour results from the interaction between attractive criminal opportunities and low self-control. The effect size for low self-control on crime ($d = 0.41$), in twenty-one empirical studies with 49,727 participants, ranks as "one of the strongest known correlates of crime" (Pratt & Cullen, 2000, p.952).

Noting the ubiquitous sex differences in criminal behaviour, Gottfredson and Hirschi (1990, p. 147) argued that greater self-control among women resulted from internalization of the stronger external and familial control exercised over daughters, rather than sons. Rejecting the need for sex-specific explanations of crime, they argued that self-control was equally relevant to offending by men and women, and this contention has been substantiated (Blackwell & Piquero, 2005; Burton, Cullen, Evans, Alarid & Dunaway, 1998; Keane, Maxim & Teevan, 1993; Piquero & Rosay, 1998; Pratt & Cullen, 2000; Tittle, Ward & Grasmick, 2003). Women have greater self-control than men (Keane et al., 1993; Nakhaie, Silverman & LaGrange, 2000; Tittle et al., 2003); and a strong hypothesis from the general theory of crime is that, when self-control is controlled, sex differences in criminal or delinquent involvement will become non-significant. This has been found in some studies (Burton et al, 1998; Tittle et al., 2003). Even when it has not eliminated the effect of sex, it has reduced it substantially (La Grange & Silverman, 1999; Nakhaie et al., 2000).

Low self-control has been measured as a combination of impulsivity, risk-seeking, preference for simple tasks and physical activities, temper, and self-centeredness (Grasmick, Tittle, Bursik & Arneklev, 1993). However, a number of researchers have found the impulsivity and risk-seeking subscales to be almost as predictive as the full scale (Arneklev, Grasmick, Tittle & Bursik, 1993; Deschenes & Esbensen 1999; Longshore, Turner & Stein, 1996; Nakhaie et al., 2000; Piquero & Rosay, 1998; Wood, Pfefferbaum & Areneklev, 1993). Of the two traits, risk-seeking shows the stronger association with crime (Nakhaie et al, 2000; LaGrange & Silverman, 1999). Together with Gottfredson and Hirschi's (1990, p.89) emphasis upon the implicit attractions of crime (“money without work, sex without courtship, revenge without court delays”), we therefore discuss this theory as representing an approach orientation to impulsivity.

Three factor theories. Cloninger (1987) has advanced a biopsychological model of personality in the field of psychiatry. He originally postulated three genetically-mediated, independent dimensions of personality: Novelty Seeking, Harm Avoidance, and Reward Dependence. The original measure of these traits was the Tridimensional Personality Questionnaire (TPQ), which was subsequently modified and renamed the Temperament and Character Inventory (TCI). Variations in the balance of these sensitivities have been used to explain a range of mental illnesses. Cloninger uses the term Novelty Seeking as an alternative to ‘impulsivity,’ clearly identifying its appetitive motivation (Cloninger, 1986). Novelty seeking is associated with activity in the dopaminergic reward system and is expressed as a tendency to respond to novel stimuli with excitement. The scale is composed of four facets: Exploratory Excitability, Impulsiveness, Extravagance, and Disorderliness. This form of impulsivity bears a strong resemblance to sensation seeking: Not only does it correlate highly (r = .68) with the Zuckerman’s ImpSS scale, but both scales correlate negatively with monoamine oxidase levels, suggesting a common biological basis (Zuckerman & Cloninger, 1996). However, unlike sensation seeking, no sex difference was found for Novelty Seeking (d = –0.04) in a recent meta-analysis (Miettunen, Veijola, Lauronen, Kantojarvi & Joukamaa, 2007).

Eysenck and Eysenck’s (1968) early two-factor personality theory identified impulsivity as a component of Extraversion, linked to low cortical arousal and a consequent need for stimulation (resulting in sensation seeking). Impulsivity was later disaggregated into two components: Impulsiveness (poor impulse control); and

Venturesomeness (stimulus hunger). The I_7 inventory was developed to measure Impulsiveness and Venturesomeness as distinct traits (Eysenck, 1993).

Venturesomeness shares the original quality of stimulus hunger, reflecting approach motivation, and hence Eysenck aligned it with Extraversion. However, evidence suggests it is more closely associated with the Psychoticism (P) dimension of tough-mindedness, hostility, and non-conformity. Indeed Zuckerman (1989) suggested that the P factor really represents his dimension of impulsive sensation seeking. In support of this contention, the ImpSS scale loads strongly on a psychoticism factor, the best marker of which is Eysenck's P scale (Zuckerman et al., 1993). In terms of item content, the Venturesomeness scale resembles sensation seeking, rather than impulsiveness (Zuckerman 1989). Men score higher than women on Venturesomeness (Eysenck, Pearson, Easting & Allsopp, 1985), and it is positively correlated with the male hormone testosterone (Aluja & Torrubia, 2004; Coccaro, Beresford, Minar, Kaskow & Geracioti, 2007; Daitzman & Zuckerman, 1980). As with Zuckerman's sensation seeking, we anticipate that Venturesomeness will show a sex difference in the male direction.

Reinforcement sensitivity theory. Gray (1970, 1982), a former student of Eysenck, proposed that extraversion and neuroticism should be rotated to form two new dimensions reflecting sensitivity to punishment (anxiety, associated with introversion and neuroticism) and sensitivity to reward (impulsivity, associated with extraversion and neuroticism). These new dimensions came to be called respectively the behavioural inhibition system (BIS) and the behaviour approach system (BAS).

Approach motivation is controlled by BAS, which is sensitive to signals of unconditioned and conditioned reward, non-punishment, and escape from punishment. Gray labelled the personality manifestation of the BAS dimension as "impulsivity", indicating that heightened reward sensitivity was viewed as the key source of impulsive behaviour. Note that Gray's reward sensitivity is not restricted to reward associated with sensation seeking or other risky enterprises: Activity in the BAS causes movement toward goals more generally. Emotionally, this system generates feelings of hope, elation, and satisfaction. Dopaminergic pathways, especially between the ventral tegmental area of the midbrain and the nucleus accumbens, are implicated in its functioning. Gray made no specific predictions in his theory regarding sex differences although, like Eysenck, his formulation addressed clinical disorders where sex differences are well established. Gray's theory has been studied extensively in relation to psychopathy, a predominantly male disorder (Cale & Lilienfeld, 2002). Patterson and Newman (1993) argued that the oversensitivity of psychopathic individuals to reward results in hyper-arousal and a consequent failure to pause and reflect when reinforcers are withdrawn. This process results in dysfunctional perseveration in mixed-incentive situations.

Measures of reward sensitivity and approach motivation. Carver and White's (1994) BIS/BAS psychometric scales have been widely used to assess Gray's two dimensions of temperament. The BAS scale factors into three subscales: Reward Responsiveness (emotional enjoyment of reward), Drive (the pursuit of appetitive goals), and Fun Seeking (the tendency to seek out new, potentially rewarding, experiences). Clearly this last scale overlaps considerably with aspects of sensation seeking; some work suggests that, unlike the other two BAS scales, it loads on a separate factor that has been called 'rash impulsiveness' (Dawe, Gullo & Loxton, 2004; Franken & Muris, 2006; Quilty & Oakman, 2004). Torrubia, Avila, Molto and Caseras (2001) developed another pair of scales to measure Gray's two dimensions, the Sensitivity to Punishment and Sensitivity to Reward Questionnaire

(SPSRQ). SPSRQ Sensitivity to Reward is correlated with Eysenck's I_7 Impulsiveness, Zuckerman's SSS, and Excitement Seeking in the Five Factor model (Mitchell, Kimbrel, Hundt, Cobb, Nelson-Gray & Lootens, 2007). The Reward scale from the Generalized Reward and Punishment Expectancy Scales (GRAPES; Ball & Zuckerman, 1990) has also been used, and shows a positive correlation with sensation seeking. A recent meta-analysis found that women scored higher than men (d = –0.63: Miettunen et al., 2007) on the Reward Dependency scale of the Cloninger's TCI, although there are important differences in item content between this and the other reward dependence measures which will be discussed later.

The two most widely used measures of sensation seeking and risk taking are Eysenck's I_7 Venturesomeness scale and Zuckerman's Sensation Seeking Scale. The Monotony Avoidance scale of the Karolinska Scales of Personality also captures the intolerance of boredom that corresponds to the SSS-Boredom Susceptibility subscale. The more recent ZKPQ contains a scale of Impulsive Sensation Seeking (ImpSS). Dickman (1990) distinguished between Dysfunctional Impulsivity (a tendency to act with less foresight than others leading the individual into difficult situations) and Functional Impulsivity (a tendency to respond quickly when the situation is optimal, such as taking advantages of unexpected opportunities). These form separate scales on the Dickman Impulsivity Inventory (DII). Those who score high on Functional Impulsivity are characterized as "enthusiastic, active individuals who are willing to take risks" (Dickman, 1990, p.98). This suggests, and data confirm, that Functional Impulsivity is closely aligned with sensation seeking: We therefore consider it with other sensation seeking measures. Other measures of sensation seeking include the UPPS Sensation Seeking scale, which resulted from Whiteside and Lynam's factor analysis of 21 impulsivity scales. Tellegen's (1982)

Multidimensional Personality Questionnaire (MPQ) also contains a subscale of Harm Avoidance, the items and structure of which correspond to reversed sensation seeking. We analyse it together with other sensation seeking measures (See Table 1).

Punishment Insensitivity and Avoidance Motivation

Here we consider approaches to impulsivity that highlight a hyposensitivity to the negative consequences of impulsive acts. These are distinguished from approaches that view impulsivity as a failure of effortful control (which we discuss later) by virtue of the fact that they deal with deficits in reactive or motivational, rather than cognitive, control.

Evolutionary theory. Campbell (1999, 2002) proposed an evolutionary account, complementary to that of Daly and Wilson (1988), that focuses on female disincentives for risk. Women's reproductive success depends to a greater extent than men's upon avoiding injury and death. This results from infants' greater dependence on the mother than on the father, women's higher parental investment in each offspring, and the limited number of offspring that a woman can bear in a lifetime. Hence, women should be more sensitive to and more avoidant of danger than men, an effect which is mediated by higher levels of fear about physical injury or death. Cross-culturally, fear is experienced more intensely and frequently by women than by men (Brebner, 2003; Fischer & Manstead, 2000). As with Daly and Wilson's formulation, the prediction is that sex differences will be manifest in those impulsivity inventories that contain an element of risk. But because Campbell's proposed mediating variable is fear, her account predicts greater harm avoidance in women than in men, and possibly greater sensitivity to punishment reflected in higher BIS scores.

Three factor theories. In Cloninger's tripartite theory, harm avoidance is mediated by activity in a serotonergic punishment system and is manifest in a tendency to respond strongly to signals of aversive stimuli by inhibiting ongoing behaviour. High scorers are "cautious, tense, apprehensive, fearful, inhibited, shy, easily fatigable, and apprehensive worriers" (Cloninger, 1987, p. 576). A recent meta-analysis (Miettunen et al., 2007) reported a small-to-moderate effect size favouring women on harm avoidance ($d = -0.33$).

When Eysenck disaggregated impulsivity, he aligned impulsiveness with Psychoticism, a dimension characterized by insensitivity to punishment, poor impulse control, and a tendency to respond without regard to interpersonal consequences (Eysenck & Gudjonsson, 1989). However, impulsiveness is not associated with testosterone, as would be expected of a facet of psychoticism (Aluja & Torrubia, 2004; Coccaro et al., 2007; Daitzman & Zuckerman, 1980), and norms for impulsiveness show no sex differences (Eysenck et al., 1985).

Reinforcement sensitivity theory. Gray's (1970) theory proposed that behaviour was governed by the balance between three motivational systems. He identified the BAS system, described earlier, as the basis for impulsivity. The behavioural avoidance system (BIS) is an aversive motivational system that is sensitive to signals of punishment, non-reward, and novelty. Activity in the BIS inhibits behaviour. Emotionally, the system is associated with feelings of fear, anxiety, and frustration. The BIS has been localized to the right anterior cortex. Gray also argued for a third flight/fight system (FFS) sensitive to innately aversive stimuli and associated with Eysenck's third dimension of psychoticism.

In a subsequent revision of the theory (Gray & McNoughton, 2000), the FFS, associated with fear, became responsible for avoidance as well as escape behaviours. The BIS, associated with anxiety, became responsible for resolving motivational conflicts between approach and avoidance. The BAS remained relatively unaltered. However these revisions, including the distinction between fear- and anxiety-related avoidance processes and the new role of the BIS, have not been reflected in personality inventories used to assess punishment sensitivity (but see Heym, Ferguson & Lawrence, 2008; Perkins & Corr, 2006). Most researchers continue to work with Gray's original formulation (Bijttebier, Beck, Claes & Vandereycken, 2009; Smillie, 2008).

As noted, Gray's work has been applied to psychopathy. Although Gray proposed that overactive BAS was the source of impulsivity, Lykken (1957) suggested that the lack of fear found in psychopathic individuals resulted in a failure to form classically conditioned associations between fear and rule breaking. Thus, such individuals lack the normal negative reinforcer (fear reduction) required for active and passive avoidance learning. Fowles (1988) suggested that individuals with psychopathy have a weak behavioural inhibition system (BIS) and hence perform particularly poorly when passive avoidance (inhibition of a response) is required. A distinction has been made between primary and secondary psychopathy that may unite these different positions. Primary psychopaths, who correspond to the popular stereotype of the disorder, experience low levels of anxiety (weak BIS), which give rise to their antisocial actions (Lykken, 1995). Secondary psychopaths, however, experience heightened negative emotions and are hyper-responsive to opportunities for reward reflected in stronger BAS (but normal BIS) reactivity. This proposal has recently received empirical support (Newman, MacCoon, Vaughn & Sadeh, 2005; Ross, Molto, Poy, Segarra, Pastor & Montanes, 2007; Wallace, Malterer & Newman, 2009).

In sharp contrast to psychopathy, anxiety disorders are found more often in women than in men (Frank, 2000), and anxiety was the original focus of Gray's (1982) BIS punishment hypersensitivity formulation. A considerable body of work has established that anxiety is associated with preferential attention to threatening stimuli. Orienting responses occur before the nature or meaning of the stimuli is consciously registered, indicating the engagement of low-level reactive processes that are automatic, unintentional, and unconscious (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg & van Ijzendoorn, 2007). This attentional bias has been shown both in patients suffering from a range of anxiety disorders (Barlow, 2002) and in non-clinical samples high in trait anxiety (Mogg, Bradley, Dixon, Fisher, Twelftree & McWilliams, 2000). Among people suffering from depression, women and girls more frequently ruminate about negative life events, which both exacerbates depressive symptoms and indicates an attentional preoccupation with punishment (Rood, Roelofs, Bogels, Nolen-Hoeksema & Schouten, 2009). Given women's higher levels of sub-clinical anxiety and depression (Costa, Terracciano & McCrae, 2001), we expect women to be particularly sensitive to cues of punishment.

Measures of punishment sensitivity. Carver and White's (1994) BIS/BAS psychometric scales include a single BIS scale that measures sensitivity to signals of punishment. This scale correlates with measures of negative affectivity, negative temperament, and anxiety. Torrubia et al.'s (2001) SPSRQ Sensitivity to Punishment scale is correlated with Carver and White's BIS, and with harm avoidance and anxiety (see also Caseras, Avila & Torrubia, 2003). Punishment sensitivity as measured by GRAPES correlates significantly with the BIS scale and anxiety (Gomez & Gomez, 2005). The TPQ/TCI measure of Harm Avoidance assesses an individual's tendency to respond intensively to signals of aversive stimuli by inhibiting or stopping behaviour (Cloninger, 1987). We include it as a measure of punishment sensitivity. (Note that the identically named scale from the MPQ measures reversed sensation seeking; see Table 1).

Effortful Control

Effortful control describes the "ability to choose a course of action under conditions of conflict, to plan for the future, and to detect errors" (Rothbart 2007, p.207). Behaviourally, it is defined as the ability to inhibit a dominant response and perform a subdominant response. It is a major form of self regulation manifested as conscious or effortful decision-making in the service of longer-term objectives. It is the planfulness and executive nature of this ability that distinguishes it from the reactive or motivational theories that we have previously described.

Evolutionary. MacDonald (2008) argued that although evolution has shaped dedicated psychological modules (adaptations) to solve recurrent evolutionary problems, the effortful control system can inhibit such 'automatic' evolved responses and thereby reduce impulsivity. MacDonald argued for sex differences in impulsivity based on strong sexual selection for male intrasexual competition, which makes approach tendencies less amenable to override by effortful control: "Males are thus expected to be higher on behavioural approach systems (sensation seeking, impulsivity, reward seeking, aggression) and therefore on average be less prone to control prepotent approach responses" (MacDonald, 2008, p. 1018). This sex difference should be particularly marked during adolescence and young adulthood, when reproductive and competitive drives are strongest. In addition, future discounting (a preference for immediate rather than delayed reward) may be adaptive for individuals growing up in highly stressful environments and may underlie the sex difference in risk taking (Kruger & Nesse, 2006; Wilson & Daly, 1997).

Bjorklund and Kipp’s (1996) proposal of evolved sex differences in impulsivity was not restricted to the domains of aggression and risk taking. They argued that inhibitory ability was especially critical to women’s reproductive success in relation to mate choice and offspring care. Because women contribute the lion’s share of parental investment, selectivity in mate choice is more important to women. This makes the ability to conceal sexual interest advantageous in the service of evaluating long-term mate prospects. Women can gain additional genetic and material resources from clandestine copulations; thus, inhibitory control over the ‘leaked’ expression of sexual interest in other men would be beneficial in securing the commitment of a long-term partner. In addition, the protracted dependency of offspring places strain on a mother’s self-control. She must prioritize the infant’s needs over her own, inhibit aggressive impulses toward it, and delay her own gratification – all of which would be aided by improved inhibitory control. Bjorklund and Kipp proposed that women’s advantage in inhibition would be relatively domain-specific, evident only in those tasks that assayed social and emotional restraint. Their narrative review supported this hypothesis, concluding that women’s greater inhibition was evident in the social domain (e.g., facial and bodily concealment of feelings), present though less strong in the behavioural domain (e.g., resistance to temptation), and absent in cognitive inhibition (e.g., Stroop test, memory interference, selective attention). This proposal predicts a female advantage in inhibitory control specifically in interpersonal domains.

Developmental. Rothbart and co-workers explored the concept of effortful control as a form of self-regulation from a developmental perspective (Rothbart & Bates, 2006; Rothbart & Derryberry, 1981; Rothbart & Posner, 2006). Their model includes lower-level motivational approaches but is distinguished by its emphasis on the child's acquisition of higher-level cognitive control of impulsivity. In the early months, infants are primarily reactive to events; the two dimensions that capture variation in their temperamental responses map onto Gray's BIS and BAS systems (Rothbart, 2007; Rothbart et al., 2000). These have been measured by scales assessing Negative Affectivity and Surgency/Extraversion, corresponding to BIS and BAS, respectively. Together these two systems modulate avoidance and approach behaviour. With increasing age the child develops effortful control, a form of self-regulatory executive control in the affective domain (MacDonald, 2008). This system is superordinate to the more primitive motivational systems, allowing the individual to suppress reactive tendencies in the service of longer-term objectives. Attention shifting and behavioural inhibition allow the child to suppress prepotent but inappropriate behaviour. The likely site of these processes is the ventromedial prefrontal cortex, particularly the orbitofrontal cortex and the ventral anterior cingulated cortex (MacDonald, 2008; Posner & Rothbart, 2009).

Lower- and higher-level systems are not wholly independent because "the motivational circuits can function as specialized learning mechanisms, guiding the development of cortical representations in light of underlying appetitive and defensive needs" (Derryberry & Rothbart, 1997, p.639). Cross-lagged correlations have been reported between early fear and later effortful control (e.g. Kochanska & Knaack, 2003). These patterns of association are attributed to the greater amenability of more fearful children to parental socialization practices (Derryberry & Rothbart, 1997). Girls are more fearful than boys (Else-Quest, Hyde, Goldsmith & Van Hulle, 2006; Hsu, Soong, Stigler, Hong, & Liang, 1981; Maziade, Boudreault, Thivierge, Caperaa & Cote, 1984); girls may therefore exceed boys in effortful control. Else-Quest et al.'s (2006) meta-analysis of childhood temperament differences revealed a large effect size favouring girls for effortful control, d = -1.01. However, this dimension is a composite of scales from the Child Behaviour Questionnaire, reflecting an easy-going, low-demand temperament that is apparently more characteristic of girls than boys. Impulsivity is measured separately as a subscale of the Surgency/Extraversion dimension, which broadly corresponds to BAS or approach motivation, showing a smaller effect size in the male direction (d = 0.18).

The development of the prefrontal cortex that mediates effortful control continues through adolescence and into adulthood (Casey, Getz & Galvan, 2008; Sternberg, 2007). Although impulsive behaviour in childhood may result from the balance between the two lower-level reactive systems, in adulthood it is likely to be associated with weak or ineffective effortful control (Posner & Rothbart, 2009). Baumeister and colleagues (Baumeister, Vohs & Tice, 2007; Muraven & Baumeister, 2000) use the term ‘self-control’ to refer to control over thoughts, emotions, performance and impulses. Self-control bears a strong similarity to effortful control and indeed Baumeister et al. (2007; p.351) describe it as a “deliberate, conscious, effortful subset of self-regulation”. It is assessed as an amalgam of self-discipline, deliberate/non-impulsive action, reliability, healthy habits, and work ethic (Tangney, Baumeister & Boone, 2004). Although sex differences have not been the focus of such research, R. Baumeister (personal communication, February 18, 2010) has suggested a likely female advantage in self-control as a result of men’s stronger impulses, especially in the domains of sex and aggression.

Measuring effortful control: Behavioural tasks. Effortful control has been studied using laboratory tasks (see Table 2 for a summary of tasks included in the present analysis). The range of tasks has been wide and the specific processes on which they depend are underspecified. In some cases, the conceptual link to impulsivity seems tenuous. Post-hoc attempts to classify them empirically have not produced consistent findings, probably as a result of the different tasks selected for inclusion in the analyses (e.g. Kindlon, Mezzacappa, & Earls, 1995; Lane, Cherek, Rhodes, Pietras & Tcheremissine, 2003; Meda et al., 2009; Reynolds, Ortengren, Richards & de Wit, 2006; Reynolds, Penfold & Patak, 2008). It is generally agreed that effortful control has two important characteristics: it involves the conscious suppression of a prepotent or dominant response, and it permits individuals to take a longer time perspective with regard to their actions. The distinction between these forms of control has been supported in factor analytic studies of behavioural tasks (Lane et al., 2003; Reynolds et al., 2008; Reynolds, Ortengren et al., 2006) and by neuroimaging studies that implicate different neural pathways for the two processes (Band & van Boxtel, 1999; McClure, Laibson, Loewenstein, & Cohen, 2004).

Four tasks have been widely interpreted as assessing the ability to suppress a dominant or prepotent response, which we will refer to as *executive response inhibition* (Conners, 2000; Kindlon et al., 1995; Lane et al., 2003; Reynolds et al., 2008; Reynolds, Richards, & de Wit, 2006; Nigg, 2001). These are the Go/No-Go task, the Stop Signal task, the Stroop test, and the Continuous Performance task. These tasks may also be sensitive to failure of interference protection and to inattention (Dougherty et al., 2009; Reynolds et al., 2008).

A second quality of effortful control is the ability to select actions by taking into account their long-term rather than immediate consequences. Individual differences in time horizons have been assessed chiefly by behavioural tasks in which a choice must be made between a larger long-term and a smaller short-term reward (Lane et al., 2003; Reynolds et al., 2008). The most popular measures are the *Delay*

Discounting Task and its variants. More impulsive individuals are believed to show a steeper rate of discounting. The *Iowa Gambling Task* (IGT) has also been interpreted as assessing time perspectives with regard to reward (Bechara, Damasio, Tranel & Damasio, 1997). More impulsive individuals persist in their attraction to short-term higher rewards despite the long-term loss to which this strategy leads. The *Balloon Analogue Risk Task* (BART) assesses a participant’s willingness to risk loss in the service of winning a higher monetary reward (Lejuez et al., 2002) and has been found to load on a common factor with delay discounting (Reynolds, Ortengren, et al., 2006; but see Meda et al., 2009). These three tasks are distinguished from lower-level ‘automatic’ responses to reward or punishment on the basis that the tasks require a conscious and deliberate decision.

Other tasks used to assess impulsivity do not clearly align themselves with the distinction between behavioural disinhibition and time horizons. We refer to these as *visual-cognitive tasks* because they are united by their use of visual attention paradigms to explore various aspects of executive function including planning, set formation and switching, and motor control. Most infer impulsivity from the number of errors made on the task, based the assumption that impulsive individuals tend to trade speed for accuracy, although this proposal has been controversial (Block, Block & Harrington, 1974; Dickman & Meyer, 1988; Malle & Neubauer, 1991; Quiroga et al., 2007; Wilding, Pankhania & Williams, 2007).

Measuring effortful control: Psychometric measures. The two cardinal aspects of impulsivity, failure to inhibit a prepotent response (e.g., “I say things without thinking”) and short time horizons (e.g., “I plan trips well ahead of time”—reverse scored) also appear as items in psychometric inventories. However, the two components are not always distinguished as separate scales. The two most commonly used inventories of general impulsivity are the Eysenck's Impulsiveness questionnaires (I_5, I_6, I_7, and the EPI) and the total score from the Barratt Impulsiveness scale. We also consider the Impulsivity scale of the Karolinska Scales of Personality as a general measure of impulsivity.

In addition to these global measures, there is an arsenal of measures for assessing subtypes of impulsivity. Many of these have been derived from factor analyses of novel or extant items and scales. Because the factor solution depends on the selection of scales included, there is little consensus on the fundamental dimensions of impulsivity. We now briefly describe some of the major conceptual distinctions that we include as measures of specific impulsivity.

The Barratt Impulsiveness Scale (the most recent version of which is the BIS-11, see Patton et al., 1995; Stanford et al., 2009) distinguishes between Attentional/Cognitive Impulsiveness (easily distracted and has difficulty in controlling thoughts), Motor Impulsiveness (acts without thinking and lacks perseverance); and Non-planning Impulsiveness (fails to make plans and is bored by cognitive complexity). The latter two scales correspond broadly to response disinhibition and short time horizon. A recent psychometric evaluation indicated no sex differences on any of the scales (Stanford et al., 2009).

Whiteside and Lynam (2001) included many existing impulsivity scales (as well as the Big Five personality traits) in a factor analysis from which they derived their four UPPS measures. UPPS is the acronym for the four subscales of this measure: Urgency, (lack of) Premeditation, (lack of) Perseverence, and Sensation Seeking. Lack of Premeditation (a failure to delay action in order to think or plan) incorporates the components of response disinhibition and time horizons. Lack of Perseverance captures poor self-discipline resulting in an inability to resist boredom and remain with a task until completion. Urgency is the tendency to act rashly when experiencing strong negative affect. Their fourth subscale, Sensation Seeking, is considered separately under sensation seeking measures.

Dickman's (1990) Dysfunctional Impulsivity scale reflects failure of deliberation and response inhibition, and we consider it as a subtype of impulsivity. We treat the Functional Impulsivity scale as a measure of sensation seeking, as discussed earlier.

Other measures of impulsivity are factors or scales taken from global personality inventories. Tellegen's (1982) Multidimensional Personality Questionnaire (MPQ) contains a facet scale of Control Versus Impulsiveness. We include this facet in preference to the higher-order factor of Constraint, which aggregates Control Versus Impulsiveness with Harm Avoidance and Traditionalism. We also include the Impulsivity/Carelessness Style scale from the Social Problem Solving Inventory (D'Zurilla, Nezu & Maydeu-Olivares, 1996).

In the NEO-PI-R, Costa and McCrae (1992) identified three forms of impulsivity. They employed the term *impulsiveness* narrowly for a facet of Neuroticism defined as the "inability to control cravings and urges" (suggesting commonality with Whiteside and Lynam's Urgency scale). Women score significantly higher than men, with effect sizes of d = –0.23 in the US and d = –0.11 in other cultures (Costa et al. 2001). The authors explicitly note this facet "should not be confused with spontaneity, risk taking or rapid decision time" (Costa and McCrae, 1992, p. 16). This last quality, which corresponds more closely with other researchers' definitions, appears to be measured by Deliberation ("the tendency to think carefully before acting") and perhaps by Self-Discipline ("the ability to begin tasks and carry them through to completion despite boredom and other distractions"). Both of these are facets of Conscientiousness, and sex differences are non- significant on both scales (Costa et al., 2001).

Despite these distinctions between subtypes, there is considerable similarity between items that belong to different scales and load on different factors. Consider for example two items: "I am a steady thinker" and "I am a careful thinker". Both are from the BIS-11 but the first assesses Attentional Impulsiveness and the second Motor Impulsiveness. The following three items again seem to have similar meanings but come from different scales and inventories: "I have trouble controlling my impulses" (UPPS Urgency); "I act on impulse" (BIS Motor Impulsiveness) and "I often make up my mind without taking the time to consider the situation from all angles" (Dickman Dysfunctional Impulsivity). The various scales include a mixture of items reflecting poor inhibition of behaviour, overly fast decision-making, restlessness, inattention, low anxiety, and failure of long-term planning. Many rely on general statements such as "I am an impulsive person," for which respondents must effectively employ their own understanding of impulsivity to formulate an answer.

In studies where psychometric and behavioural measures are both employed, weak or non-significant correlation between them are typically reported (Crean, de Wit & Richards, 2000; Gerbing, Ahadi, & Patton, 1987; Helmers, Young & Pihl, 1995; Lane et al., 2003; Malle & Neubauer, 1991; Milich & Kramer, 1984; Paulsen & Johnson, 1980; Mitchell, 1999; Reynolds et al., 2008; Reynolds, Ortengren, et al., 2006; Reynolds, Richards, et al., 2006; White et al. 1994). Those significant correlations that do emerge are not consistently between measures on which congruence would be expected (Kirby, Petry & Bickel, 1999; Mobini, Grant, Kass & Yeomans, 2007; Swann, Bjork, Moeller & Dougherty, 2002).

Overview of the Study

As the preceding discussion indicates, there is a wide range of measures designed to assess impulsivity based on disparate theoretical approaches and operationalisations. A researcher wishing to use impulsivity as an explanatory variable might use any one of these, depending on his or her definition of impulsivity and the reason for wanting to measure it. Part of the aim of the present analysis was to demonstrate the variety of ways that psychologists measure impulsivity and to examine the extent to which significant sex differences depend upon the choice of measure and conceptual approach. We therefore begin our analysis by computing effect sizes separately for each measure of impulsivity. Following this, we group the measures into domains based on differences in the conceptualization and measurement of impulsivity.

Six Domains of Impulsivity Measurement

We group the measures into the following six domains (see Table 1 for an overview): (a) reward sensitivity, (b) punishment sensitivity, (c) sensation seeking and risk taking, (d) general impulsivity (e) specific forms of impulsivity, and (f) behavioural measures of impulsivity. What follows is a brief outline of each domain.

Table 1:

Summary of measurement categories by domain

Category	Measure(s)
	Reward Sensitivity
Sensitivity to Reward and Sensitivity to Punishment Questionnaire (SPSRQ) and Generalized Reward and Punishment Expectancy Scales (GRAPES)	SPSRQ (Torrubia et al, 2001): Reward scale; GRAPES (Ball & Zuckerman, 1990): Reward scale
Tridimensional Personality Questionnaire–Temperament and Character Inventory (TPQ–TCI) Reward Dependence	TPQ (Cloninger, 1986): Reward scale; TCI (Center for Wellbeing, n.d.): Reward scale
Behavioral Activation System (BAS) Total	BAS (Carver & White, 1994): Total score
BAS Drive	BAS (Carver & White, 1994): Drive scale
BAS Fun	BAS (Carver & White, 1994): Fun Seeking scale
BAS Reward	BAS (Carver & White, 1994): Reward scale
	Punishment Sensitivity
SPSRQ and GRAPES	SPSRQ (Torrubia et al, 2001): Punishment scale; GRAPES (Ball & Zuckerman, 1990): Punishment scale
TPQ–TCI Harm Avoidance	TPQ (Cloninger, 1986): Harm Avoidance scale TCI (Center for Wellbeing, n.d.): Harm Avoidance scale
Behavioural Inhibition System (BIS)	BIS Scale (Carver & White, 1994)

Category	Measure(s)
	Sensation seeking and risk taking
Venturesomeness	I_5 (S. B. G. Eysenck & Eysenck, 1978), or $I_{6\text{ and }}I_7$ (S. B. G. Eysenck et al, 1985): Venturesomeness Scale
Sensation Seeking Scale (SSS) Total	SSS Form II (Zuckerman et al, 1964), Form IV (Zuckerman, 1971), or Form V (Zuckerman et al, 1978): Total score
SSS Thrill & Adventure Seeking	SSS Form IV (Zuckerman, 1971), Form V (Zuckerman et al, 1978), or Form VI (Zuckerman, 1984): Thrill and Adventure Seeking Scale
SSS Experience Seeking	SSS Form IV (Zuckerman, 1971) or Form V (Zuckerman et al, 1978): Experience Seeking Scale
SSS Disinhibition	Sensation Seeking Scale Form IV (Zuckerman, 1971), V (Zuckerman et al, 1978), or VI (Zuckerman, 1984): Disinhibition Subscale
SSS – Boredom Susceptibility	SSS Form IV (Zuckerman, 1971) or Form V (Zuckerman et al, 1978): Boredom Susceptibility Scale
UPPS Sensation Seeking	UPPS Impulsive Behavior Scale (Whiteside & Lynam, 2001): Sensation Seeking scale
Dickman Functional Impulsivity (DIF)	DIF (Dickman, 1990): Functional Impulsivity scale
Risk Taking	All measures of risk taking including: The Jackson Personality Inventory (Jackson, 1994): Risk Taking scale; Risky Impulsivity (Campbell & Muncer, 2009); and any measures developed for specific studies

Category	Measure(s)
Zuckerman-Kuhlman Personality Questionnaire (ZKPQ) Impulsive Sensation Seeking	ZKPQ (Zuckerman & Kuhlman, 1993): Impulsive Sensation Seeking scale
Karolinska Scales of Personality (KSP) Monotony Avoidance	(KSP (Schalling, 1978): Monotony Avoidance scale
Multidimensional Personality Questionnaire– Personality Research Form (MPQ–PRF) Harm Avoidance	MPQ (Tellegen, 1982), or PRF (Jackson, 1994): Harm Avoidance scale
Sensation Seeking (other measures)	Any measure of sensation seeking not specified elsewhere, including: the Tridimensional Personality Questionnaire (Cloninger, 1986): Novelty Seeking scale; the Arnett Inventory of Sensation Seeking (Arnett, 1994), and any measures developed for specific studies
Effortful Control: General measures of impulsivity	
Eysenck measures of impulsiveness	I_5 (S. B. G. Eysenck & Eysenck, 1978), or $I_{6\text{ and }}I_7$ (S. B. G. Eysenck et al, 1985;), Eysenck Personality Inventory (H. J. Eysenck & Eysenck, 1968): Impulsiveness scale
Barratt Impulsiveness Scale (BIS) Total	BIS-10 (Barratt, 1985), BIS-11 (Patton et al, 1995)[a]: Total score
Karolinska Scales of Personality (KSP) Impulsivity	KSP (Schalling, 1978): Impulsivity scale

Category	Measure(s)
Other measures	Any measure of impulsivity not specified elsewhere, including Personality Research Form (Jackson, 1994): Impulsivity scale, NEO Personality Inventory– Revised (Costa & McCrae, 1992): Impulsivity facet, Self-discipline and Deliberation scales; and any measures developed for specific studies in the review
	Effortful Control: Specific forms of impulsivity
BIS Cognitive	BIS-10 (Barratt, 1985), BIS -11 (Patton et al, 1995)[a]: Cognitive/Attentional Impulsiveness scale
BIS Motor	BIS-10 (Barratt, 1985), BIS -11 (Patton et al, 1995)[a]: Motor Impulsiveness scale
BIS Non-planning	BIS-10 (Barratt, 1985), BIS -11 (Patton et al, 1995)[a]: Non-Planning Impulsiveness scale
UPPS Perseverance	UPPS Impulsive Behavior Scale (Whiteside & Lynam, 2001): Lack of Perseverance scale
UPPS Premeditation	UPPS Impulsive Behavior Scale (Whiteside & Lynam, 2001): Lack of Premeditation scale
UPPS Urgency	UPPS Impulsive Behavior Scale (Whiteside & Lynam, 2001): Urgency scale
Dickman Dysfunctional Impulsivity (DDI)	DDI (Dickman, 1990): Dysfunctional Impulsivity scale
Impulse Control	Any measure of impulse control, including the Offer Self-Image Questionnaire (Offer et al, 1982): Impulse Control scale; Multidimensional Personality Questionnaire (Tellegen, 1982), Control scale; and any measures developed for

Category	Measure(s)
	specific studies in the review
Social Problem Solving Inventory–Revised (SPSI-R)	SPSI-R (D'Zurilla et al, 1996)[a]: Impulsive/Careless Style scale
Effortful Control: Behavioural measures of impulsivity	
Balloon Analogue Risk Task (BART)	BART (Lejuez et al., 2002)
Delay Discounting	Any delay discounting task (see, e.g. Mazur, 1987, Richards et al, 1999) using real or hypothetical rewards including money, sweets, and cigarettes
Executive Response Inhibition	Stop Signal Task (Logan et al,1997), Go/No-Go task (Newman et al, 1985), any Stroop-based task (Stroop, 1935), Continuous Performance Test (Conners, 2000), and Inhibitory Reach task (Enticott et al, 2006)
Iowa Gambling Task (IGT)	IGT (Bechara, 1994)
Visual-cognitive Tasks	Matching Familiar Figures Test (Kagan et al, 1964), Intradimensional/Extradimensional learning task (Roberts et al, 1988), Tower of London Test (Shallice, 1982), Porteus Maze (Porteus, 1950), Trail-Making Test (Reitan, 1958), Visual Comparison Task (Dickman & Meyer, 1988), and Spatial Orientation Dynamic Test–Revised (Colom et al, 2003)

Note. UPPS = Urgency, Premeditation, Perseverance, and Sensation Seeking

[a] Includes versions translated into other languages

Reward sensitivity and punishment sensitivity are included as two distinct domains to address the suggestion that impulsivity might be explained by oversensitivity to reward or by deficiencies in sensitivity to punishment. Sensation seeking and risk taking measures are distinguishable from impulsivity measures by their greater emphasis on risk, sensation, and danger than on the impulsiveness of the action. Such inventories clearly identify themselves as concerned with sensation seeking or subtypes thereof.

General impulsivity includes inventories that pose questions at a general level (e.g., “I am an impulsive person”) rather than specifying contexts or distinguishing psychological functions. Impulsivity is generally assessed here as a global construct as opposed to subtypes (e.g., motor impulsiveness). Studies reporting total scores derived from summing or averaging specific subscales are analysed here. Specific forms of impulsivity assess impulsivity in specific psychological processes or contexts. Specific measures stem from factor analytic studies indicating that impulsivity is multidimensional. (Note that UPPS Sensation Seeking and Dickman Functional Impulsivity are included in the sensation seeking category rather than specific forms.) Finally, behavioural measures are included as a separate domain to maintain the distinction between psychometric self-report measures and behavioural tasks. This domain includes executive response inhibition tasks (e.g. the Stop Task); visual-cognitive tasks (e.g. the Matching Familiar Figures Test); The Iowa Gambling Task; Delay Discounting; and the BART (for a description of these tasks, see Table 2).

Table 2:

Summary of behavioural tasks of impulsivity.

	Executive response inhibition tasks
Go/No-go	Two randomly alternating stimuli are presented (e.g. a car and a house). The respondent is instructed to respond selectively to one but not the other by pressing a button. One stimulus is presented more frequently to establish a prepotent response. Commission errors index impulsivity.
Stop signal	Similar to the Go/No-Go task, but on some trials a signal (usually auditory) is given immediately after the critical target stimulus. On these trials, the respondent must inhibit their response. The delay between the onset of the stimulus and the onset of the signal to stop is varied until participants successfully inhibit their go responses on 50% of trials. At this point, stop-signal reaction time (SSRT) is estimated as the difference between the stop-signal delay and the mean go reaction time. Longer SSRTs index higher impulsivity.
Continuous performance task	Letters appear one at a time on a screen. The respondent must press a button when a particular sequential configuration (e.g. C followed by A) is shown. Commission errors index impulsivity.
Stroop	In the control condition, the respondent names aloud the ink colour of a row of XXXX as quickly as possible. In the interference condition which follows, the respondent must name aloud the ink colour in which a series of words is written: Each word is a colour name (e.g. red) that is different from the ink colour (e.g. blue) used to print it. The two conditions are compared and the disparity between them is a measure of the time taken to resolve the conflict between an automatic, non-desired response (word reading) and a non-automatic, desired response (colour naming). Hence, a larger value indexes lower effortful control. Some researchers also use errors or time taken in the interference condition

Visual cognitive tasks	
Matching familiar figures task (MFFT)	A target design is presented together with a number of similar designs. The task is to match the target with its identical version. Speed and errors reflect impulsivity.
Visual comparison task	Similar to MFFT, but the respondent is presented with two very similar figures and makes a 'same' or 'different' decision.
Trail Making Test	The participant draws lines joining 25 circles distributed over a sheet of paper. In Part A, the circles are numbered 1 – 25, and the respondent connects the numbers in ascending order. In Part B, the circles include both numbers (1 – 13) and letters (A – L). The respondent is asked to alternate between numbers and letters (i.e., 1-A-2-B-3-C, etc.). The participant is instructed to work quickly and not to lift the pen from the paper. Errors are pointed out to the respondent and correction is allowed. Errors affect the score by increasing the time taken to complete the task. The time taken for Part A is subtracted from the time taken for Part B. A smaller value reflects impulsivity.
Porteus maze	This is a graded set of paper forms on which the respondent traces the way from a starting point to an exit, avoiding blind alleys. There are no time limits. The mazes vary in complexity from simple diamond shapes to intricate labyrinths. The Q score, used to index impulsivity, is obtained by measuring the number of times the pencil is lifted, touches the boundary, etc.
Circle tracing	Respondents are asked to trace over a 9 inch circle as slowly as they can. The start and stop position are clearly marked on the circle in bright letters. Impulsivity is indexed by time taken to perform the task on the second trial.
Spatial orientation dynamic task (R)	A computerised task in which participants move a red and a blue dot toward a specific destination. The program sets a course for the two dots that can be modified by pressing arrow buttons for each of the dots. The dependent

	measure is the mean deviation (in degrees) between the course of each of the moving dots at the end of the trial and the course it should have taken to reach its destination. Impulsivity is indexed as a high mean deviation.
Tower of London	A board presents coloured discs or beads arranged on three vertical pegs. These form a target array which the participant must try to replicate on his or her own board where the discs or beads are arrayed differently across the three pegs. Measures include preplanning time (time between seeing the discs and making the first move), errors on the first move, average move time (time spent on executing the plan), trials solved in the minimum number of possible moves or within a specified time limit, and excess moves (number of moves in excess of the minimum necessary to complete the task).
Intradimensional extradimensional shift	Two dimensions (colour filled shapes and white lines) are used. Simple stimuli use only one of these dimensions, whereas compound stimuli are made up of both (e.g. white lines overlaying colour-filled shapes). The participant starts by seeing two simple colour-filled shapes, and must learn which one is correct by touching it. Through feedback, the participant learns which stimulus is correct. After six correct responses, the stimuli and/or rules are changed. These shifts are initially intra-dimensional (e.g. colour-filled shapes remain the only relevant dimension), then extra-dimensional (white lines become the only relevant dimension). The test has a number of outcome measures (including errors, and numbers of trials and stages completed) which index impulsivity.

Delay discounting

The participant makes a series of dichotomous choices between a “standard’” (e.g. $10 available after one of six delays: 0, 7, 30, 90, 180, 365 days) and an “alternative” sum of money available immediately (e.g. 23 values between $0.01 and $10.50), resulting, in this case, in 137 choices. The choices are presented in random order. The indifference point or switch point (the point at which the participant

	prefers the immediate to the delayed reward) is determined for each level of the standards. This can be used to calculate k, the rate at which the standard of $10 is discounted as a function of delay. Impulsive individuals show lower switch points and a higher value of k (a steeper rate of discounting) than less impulsive individuals. Variations on this task include probability discounting task (which uses probabilistic rather than delayed rewards) and the experiential delay task (in which participants choose between a probabilistic delayed sum and a smaller sum that is immediate and certain).
	The Iowa Gambling Task
	The participant is shown four decks of cards. Each card informs them of a win, or a simultaneous win and loss of money. Two "disadvantageous" card decks (A and B) yield high monetary rewards but higher occasional losses. Two "advantageous" decks (C and D) yield low rewards but lower occasional penalties. Impulsive individuals continue to choose from the disadvantageous decks despite the long-term loss to which this strategy leads. The outcome measure is normally the number of draws from disadvantageous packs (A and B) subtracted from advantageous packs (C and D). This is taken as a measure of impulsivity manifest in a preference for short–term gains in spite of long-term losses.
	The Balloon Analogue Risk Task (BART)
	A computer screen shows a balloon and pump. Each click on the pump inflates the balloon and, with each pump, 5 cents are earned in an invisible temporary reserve. Participants are told that at some point each balloon will explode. When a balloon is pumped past its explosion point, an audible "pop" signals that all the money in the temporary reserve is lost. At any point during a trial, the participant can stop pumping the balloon and transfer the money in the reserve to the permanent bank. After each balloon explosion or money transfer, a new balloon appears. The dependent measure is normally the average number of pumps excluding balloons that exploded (i.e., the average number of pumps on each balloon prior to money collection). This reflects a tendency to continue with balloon inflation despite the risk of losing the money already won on that trial.

Hypothesised Sex Differences

Men are expected to score higher on sensation seeking and risk taking measures. At an evolutionary level, this expectation derives from men’s lower parental investment and the consequent reproductive benefits associated with risk taking in the service of mate competition and hunting. This sex difference, to the extent that it derives from an evolved module, is likely to occur at a motivational level and to be resistant to conscious or strategic control (MacDonald, 2008). Most theorists attribute men’s greater sensation seeking to a strong appetitive motivation and thus predict that men should demonstrate higher BAS or sensitivity to reward than women. We therefore predict a male advantage on measures of reward sensitivity. However, Campbell argues from an evolutionary perspective that women’s aversion to sensation seeking results from their lower threshold for experiencing fear. Similarly Cloninger (1987), from a proximal genetic and neurochemical basis, argues for greater harm avoidance by women. Women’s higher levels of anxiety and depression suggest a greater sensitivity to threatening stimuli. We expect this to be reflected in higher BIS and sensitivity to punishment scores among women. We therefore predict a female advantage on measures of punishment sensitivity

Effortful control is represented in three of our measurement domains: general impulsivity, specific forms of impulsivity, and behavioural measures of impulsivity. Developmental studies have shown a large effect size favouring girls for effortful control (Else-Quest et al., 2006) and, in their narrative review, Bjorklund and Kipp (1996) claimed a female advantage in social and behavioural tasks in line with their evolutionary hypothesis. Several researchers have proposed that the greater strength of male drives makes them harder to hold in check (MacDonald, 2008;

Zuckerman, 1994). All of this evidence suggests that effortful control will be stronger in women than in men.

When we consider effortful control conceptualisations of impulsivity, however, sex differences are likely to depend on the inventory or task used (Costa et al., 2001; Feingold, 1994; McCrae et al., 2005). Different behavioural measures appear to assess quite different components of impulsivity, ranging from errors in spatial navigation to a tendency to favour immediate over delayed reward. Psychometrically measured specific forms of impulsivity also cover a broad range of behaviours from an inability to resist food when depressed to a tendency not to plan tasks carefully. Furthermore, the general wording of some general impulsivity measures (e.g., “I act on impulse”) may result in men’s and women’s tending spontaneously to think of different sex-typical contexts. This tendency would diminish the power to detect consistent sex differences. Therefore, although we tentatively predict that women will demonstrate greater effortful control than men, we expect considerable inconsistency in the domains of behavioural measures and specific forms of impulsivity and only a modest effect of sex on general measures.

Variance Ratios

In addition to examining sex differences in central tendency, we also compute male: female variance ratios for different measures of impulsivity. A male-biased variance ratio has been found for a number of physical and psychological traits (Hedges & Nowell, 1995; Lehre, Lehre, Laake & Danbolt, 2009). From an evolutionary perspective, Archer and Mehdikhani (2003) proposed that men are freer than women to vary in their levels of parental investment, giving rise to greater male variability on sexually selected traits. Their analysis bore this out for measures of physical aggression and mate choice. The present data afford the opportunity to extend this proposal of greater male variance, as well as a higher male mean, for impulsivity – a trait that has also been argued to be sexually selected (Daly & Wilson, 1988).

Method

Sample of Studies

The initial search was conducted using the database PsycINFO, which has a broad coverage of psychology and social science journals as well as unpublished dissertations. Search terms included the key words *impulsivity* and *impulsiveness* but not *sex* or *gender* in order to prevent selection bias. Specific inventories were not subject to search because the aim was to identify the range of measures used for assessing impulsivity. This was especially important due to historic variations in the conceptualisation and operationalisation of this concept. The following search limits were imposed: (a) human populations only, (b) English language only, (c) male and female populations, (d) age groups above the age of 10, and (e) articles published between 1980 and 2008. The search yielded 3,156 abstracts.

Abstracts were screened, and any articles failing to meet the following criteria were removed: (a) the study was empirical, (b) the sample included a minimum of 10 males and 10 females, (c) data from normative samples were reported (defined as samples with no specified a priori selection factors regarding traits or behaviours; for example, samples of individuals with alcoholism or children of individuals with alcoholism were excluded whereas studies of the drinking habits of normative student populations were included; where clinical studies were examined, data were recorded only from normative control groups), (d) self-reported, psychometric and/or behavioural measures were used, (e) impulsivity was measured as an independent construct (for instance, some common ADHD checklists amalgamate hyperactivity and impulsivity into a single dimension and report a single combined measure; such scales were excluded), (f) data were presented or potentially available from which a sex difference could be calculated. Where abstracts did not provide sufficient information to establish whether they met the inclusion criteria, they were included in the next stage of the selection process.

One thousand and sixty-five articles were downloaded or requested through interlibrary loan, and 70 unpublished dissertations were downloaded via the ProQuest database. If an article met the inclusion criteria but lacked sufficient data for an effect size to be computed, authors were contacted by email if the article had been published within the last 5 years. Two hundred and three such requests were made with 75 usable responses. In 12 cases, authors provided additional data from studies not identified in the initial search.

Ultimately, 244 articles and 33 unpublished studies were included in the meta-analysis, giving a total of 277 studies with 310 samples. From these, 741 d values were calculated (see Appendix A and Appendix B for a listing of all studies included in the analysis).

Coding the Studies

For each study, the following information was coded: (a) all statistics relevant to the magnitude of the sex difference (means, standard deviations, correlations, t and F tests), (b) the number of male and female participants, (c) the measures of impulsivity employed in the study, (d) the population studied (university, community, schools or colleges), (e) the age of the sample (mean, standard deviation, or range), (f) the nationality of the sample, (g) the publication status of the study, and (h) The sex of the first author. The coding of categorical variables was undertaken by two coders. Cohen’s kappa was calculated as a measure of interrater agreement and ranged from .83 (age) to 1.00 (publication status). Discrepancies were checked and resolved by agreement between the two coders. Across all measures, 741 effect sizes were analysed with a total sample size of 149,496 participants from 27 different countries (see Table 3).

Grouping by Category and Domain

Effect sizes were grouped into forty measurement categories (see Table 1). Of these, thirty five represented established measures. Some studies, however, used measures created specifically for their study, unpublished measures, or measures that did not appear more than twice in the whole sample of studies. These were placed into one of five general categories: general impulsivity other measures, sensation seeking other measures, risk taking, impulse control, and visual-cognitive tasks.

Measures were also grouped into six domains of impulsivity, as outlined in the Introduction (see Table 1). Given the lack of consensus about the dimensionality and conceptualisation of impulsivity, some researchers may disagree with these groupings. Results are therefore presented to allow examination on both a category-by-category basis and by domain.

Statistical Analysis

Statistical independence. The requirement of independence of observations means that the same sample could not be included multiple times when computing an aggregate effect size. Many studies used multiple measures of impulsivity. Aggregating studies by measure does not violate this requirement of independence. However in the domain-level analysis, where multiple measures from a sample were grouped in the same domain, the mean of the d values for the measures was included. Effect sizes and variance ratios were calculated for all categories and domains.

Mean difference effect sizes. Formulae for calculating effect sizes were taken from Lipsey & Wilson (2001). For reported measures, Cohen's d was calculated (by dividing the difference between male and female means by an estimate of the pooled standard deviation):

$$d = \frac{\bar{x}_{male} - \bar{x}_{female}}{sd_{pooled}}$$

Four effect sizes were reported by the authors. Where d values were not reported, d was calculated either by converting existing parametric statistics such as F (15 effect sizes), t (12 effect sizes), or r values (72 effect sizes), or directly from published or provided means and standard deviations (559 effect sizes). Seventy-nine values were estimated as 0 where non-significant gender differences were reported but no relevant statistics could be located. In the Results section, summary effect sizes including and excluding these conservatively estimated d values are reported. Following convention, female means were subtracted from male means so that positive d values represent higher male than female scores.

Outliers, heterogeneity and moderator analysis. Outliers were identified on a category-by-category basis as follows. Cases where the effect size was estimated as 0 due to insufficient data were removed. z-scores were calculated for the remaining d values. Values of d with z scores outside the range of -2.5 and 2.5 were classified as outliers and subsequently removed from analysis. Results are reported both including and omitting outliers.

The heterogeneity statistic, Q, was calculated for each analysis. Q statistics test for equality of effect sizes within each analysis, and follow a chi square distribution with k -1 degrees of freedom (Hedges & Olkin, 1985). A simplified formula is as follows:

$$Q = \sum_{i=1}^{k} w(d_i - \bar{d})^2$$

Where $w = \frac{1}{v}$, $= \frac{N_{male} + N_{female}}{N_{total}} + \frac{d^2}{2(N_{total})}$, and k is the number of effect sizes.

Significant Q statistics are indicative of the presence of a non-heterogeneous dispersion between effect sizes, but not its magnitude. Q can be sensitive to sample size (Higgins & Thompson, 2002; Hardy & Thompson, 1998), and its significance is expected when analysing considerable numbers of studies (Higgins, 2008). Heterogeneity is incorporated into estimates of effect size via random effects models.

Random-effects model. Random effects models make the assumption that the variation between studies is attributable not only to sampling differences between studies, but also to other, unspecified influences within studies. It assumes effect size parameters to be randomly sampled and estimates these parameters based on the population (but see Schulze, 2004). The random effects model is particularly appropriate when effect sizes are significantly heterogeneous. The conceptual background of this study suggested that heterogeneity within the various measures and domains was likely and so a random effects model was implemented a priori.

Moderator analyses were performed for each measure, in order to explore study variables potentially accounting for variability in effect sizes. Significant Q statistics were not considered prerequisites for conducting a moderator analysis (see Rosenthal & DiMatteo, 2002). The moderator variables tested were as follows: age (grouped by mean age into five levels: 10-15 years, 15-18 years, 18-21 years, 21-30 years, 30-40 years, 40 years and over); population (grouped into three categories: university students, community samples, school samples); geographical area (grouped into three categories: USA, Canada & Central America; UK, Europe, Australia & New Zealand; Asia, Africa, & the Middle East); sex of first author; and publication status of the study. The test statistic for the moderator analysis is Q_B, which is analogous to the F statistic in ANOVA (Hedges & Pigott, 2004). A significant Q_B denotes that the effect sizes for the different subgroups in the analysis differ significantly.

Variance ratios. Untransformed variance ratios were calculated wherever sufficient data were available, resulting in 475 values. Ratios were computed by dividing the male variance by the female variance. Greater male than female variability is therefore reflected in values greater than one. Following previous authors (Else-Quest et al., 2006), ratios were transformed via base-10 log before calculating category means.

Publication bias. In many of the studies retrieved for this meta-analysis, sex was not a variable of interest, making publication bias less likely. Nevertheless, the possibility of publication bias was explored where possible. Two methods were employed. First, a moderator analyses was run to determine if effect sizes for published studies significantly differed from unpublished studies. Second, following Begg and Mazumdar (1994), the rank correlation between standard error (largely a function of sample size) and effect size for studies within domains was calculated. This is a statistical analogue of a funnel plot. Because the assessment of publication bias by any means is unreliable where the number of studies is small (Borenstein, Hedges, Higgins, & Rothstein, 2009), this test was implemented only for categories with at least 20 studies.

Statistical software. d values and Q statistics were calculated using SPSS; while the random effects models, moderator analyses, and tests for publication bias were run using CMA Version 2 (Biostat Inc., 2008).

Table 3

Summary statistics for all samples included in the analysis

Category	k	Male N	Female N
Age (years)			
11-15	34	13215	14032
15-18	42	21395	22333
18-21	84	12492	18856
21-30	76	8964	11516
30-40	29	5239	7489
>40	19	3605	4050
Age not specified or wide age range	26	2911	3400
Geographical area			
United States, Canada, and Central America	184	41467	46807
United Kingdom, Europe, Australia, and New Zealand	115	23525	31838
Asia, Africa, and Middle East	11	2830	3030
Population			
Schools (up to age 18)	51	29264	30019
University/college students	147	17203	27107
Community	89	16073	18388
Mixed or not specified	23	5282	6162
Publication status			
Published	275	61220	74898
Unpublished	35	6601	6777

Category	k	Male N	Female N
Domain			
General measures of impulsivity	206	50805	62428
Specific measures of impulsivity	62	7873	10891
Sensation seeking and risk taking	130	23402	28914
Reward sensitivity	18	2380	3598
Punishment sensitivity	19	2698	4212
Behavioural measures	50	3746	3753
Grand total[a]	310	67821	81675

[a]Obtained by summing the total number of participants for all 310 samples

Results

Tables 4–7 report effect sizes by measure and associated statistics, as well as the overall effect size for the impulsivity domains to which they have been assigned: reward sensitivity, punishment sensitivity sensation seeking and risk taking, and general impulsivity. We do not aggregate the results from specific forms of impulsivity and behavioural measures of impulsivity because, in these domains, aggregation would violate the distinctiveness of the measures. Results from these domains are presented in Tables 8 and 9, respectively. For a complete list of effect sizes and variance ratios for all studies, see Appendix A. This Appendix also identifies the authors of the study, the number of male and female participants, moderator variables coded (age, population, geographical area, sex of first author, published or unpublished source) and the impulsivity measures used.

Table 10 shows the significant moderator variables for each measure. All moderators significant at $p < .05$ are reported in these tables but, because of the large number of analyses conducted and the consequent inflated likelihood of Type 1 errors, only those that were significant at $p < .01$ are discussed in the text. We also restrict our discussion of significant variance ratios to those where $p < .01$.

Reward Sensitivity

Overall effect sizes. For the domain general analysis, there were 18 effect sizes, all but one of which were computed (see Table 4). The overall effect size was negligible and non-significant ($d = 0.01$). However, there was marked variation in the direction and magnitude of effect sizes for specific measures.

The effect size for the BAS Total score was non-significant but slightly favoured women ($d = –0.13$). This was chiefly due to women's significantly higher scores on the BAS Reward subscale ($d = –0.27$). The BAS Reward scale poses questions about emotional responsiveness (e.g., "When good things happen to me, it affects me strongly"). Women outscored men even more strongly on the TCI scale of Reward Dependence ($d = –0.56$). This scale, despite its name, is composed of subscales specifically assessing "sentimentality, social sensitivity, attachment, and dependence on approval by others" (Center for Wellbeing, n.d., "What does the TCI measure?" para. 6). These are areas where past research suggests women should score highly (Cross & Madsen 1997).

The female advantage on these scales stands in contrast to the sex difference favouring men on the SPSRQ and GRAPES Reward scales ($d = 0.44$). These latter two scales contain many items that oriented to competitive success and ambition (e.g., SPSRQ: "Are you interested in money to the point of being able to do risky jobs?"; GRAPES: "I expect that I will rise to the top of any field of work I am or will be engaging in"). Thus there appeared to be differences in the conceptualisation and contextualisation of reward that are potentially confounded with masculinity and femininity.

The remaining two BAS scales (Drive, d = 0.06 and Fun, d = 0.08) yielded non-significant sex differences. Again, this null result might be related to the way in which the constructs are operationalised. Although the Drive scale appears to have an appetitive component reflecting ambition, it differs from the SPSRQ in that it does not refer specifically to money or status. Instead, the item wording is again very general (e.g., “I go out of my way to get things I want”). The Fun scale contains items that appear to tap impulsivity (e.g., “I often act on the spur of the moment”). It is therefore perhaps unsurprising that the modest effect sizes on these two scales were in line with that found for the domain of general impulsivity (see Measures of General Impulsivity).

Moderator analysis. Only the BAS Total and the BAS Reward scale showed significant heterogeneity. Moderator analyses were performed on all measures (see Table 10). Only one was significant at $p < .01$: Age moderated the sex difference in BAS Reward, with a smaller sex difference for samples aged 18-21 years (d = –0.16) than for the 21-30 age group (d = –0.54).

Variance ratios. Mean anti-log variance ratios can be found in Table 4. None are significantly different from 1.

Table 4

Sex differences (d) in measures of reward sensitivity

Measure	d	95% CI	k	N men	N women	Q	VR (*k*)
SPSRQ/GRAPES							
All studies	0.42	.33/.52	9	1091	2443	13.57	1.05 (9)
Computed only[a]	0.44	.36/.53	8	1068	2358	9.83	1.05 (9)
TPQ/TCI Reward Dependence							
All studies	-0.56	-.68/-.44	4	437	841	2.22	1.08 (4)
BAS Total							
All studies	-0.13	-.38/.12	4	420	537	9.13*	0.80 (4)
BAS Drive							
All studies	0.06	-.04/.15	9	1201	1372	9.19	0.96 (9)
BAS Fun							
All studies	0.08	-.01/.17	9	1201	1372	8.71	1.08 (9)
BAS Reward							
All studies	-0.27	-.41/-.13	9	1201	1372	19.35*	0.95 (9)
Total of reward sensitivity measures							
All studies	0.01	-.17/.19	18	2380	3598	340.90***	1.03 (44)
Computed only[a]	0.01	-.18/.20	17	2357	3513	340.86***	1.03 (44)

Note: Effect sizes are in the male direction if positive and in the female direction if negative.

[a]Removed: Avila & Parcet (2000)

* $p < .05$. ** $p < .01$. ***$p < .001$

CI = confidence interval; *Q* = homogeneity statistic; VR (*k*) = mean variance ratio (number of sample sizes from which variance ratios could be calculated)

Punishment Sensitivity

Overall effect sizes. For the domain general analysis, there were 18 independent effect sizes, all but one of which were computed (see Table 5). There was a significant, small to moderate effect size favouring women (d = –0.33), although, once again, there was variation in the magnitude as a function of the measure used.

All three measures showed a difference in favour of women, two of which were significant. TCI Harm Avoidance (d = –0.43) assesses feelings of anxiety in unpredictable situations (e.g., "Usually I am more worried than most people that something might go wrong in the future"). The gist of the item content is very similar to that of the BIS, on which there was a moderate to large sex difference (d = –0.63). BIS items are also concerned with anxiety in the face of failure (e.g., "I feel worried when I think I have done poorly at something important", "If I think something unpleasant is going to happen I usually get pretty 'worked up'"). Both TCI Harm Avoidance and the BIS therefore assess emotional responses to actual or anticipated punishment.

The aggregated effect size for SPSRQ and GRAPES measures was again in the female direction but only approached significance (d = –0.12). Many of the GRAPES items appear to tap pessimism and anticipatory worry in a similar way to the above scales (e.g., "When there is a disease going around, I worry about getting it", "In light of all the crime in the world. I expect to be the victim of a mugging or an assault at some point during my life.").

Table 5

Sex differences (d) in measures of punishment sensitivity

Category	d	CI	k	N men	N women	Q	VR (*k*)
SPSRQ/GRAPES							
All studies	-0.11	-.23/.00	9	1136	2563	18.50*	0.97 (9)
Computed only[a]	-0.12	-.24/.01	8	1113	2478	18.31*	0.97 (9)
TPQ/TCI Harm avoidance							
All studies	-0.43	-.52/-.33	5	784	1391	4.43	1.08 (4)
BIS of BIS/BAS							
All studies	-0.63	-.74/-.52	8	1026	1197	8.65	1.14 (8)
Total of punishment sensitivity measures							
All studies	-0.32	-.45/-.19	18	2598	4091	119.46***	1.05 (21)
Computed only[a]	-0.33	-.47/-.20	17	2575	4006	117.63***	1.05 (21)

Note: Effect sizes are in the male direction if positive and in the female direction if negative.

[a]Removed: Avila & Parcet (2000)

* $p < .05$. ** $p < .01$. *** $p < .001$

CI = confidence interval; *Q* = homogeneity statistic; VR (*k*) = mean variance ratio (number of sample sizes from which variance ratios could be calculated)

However the SPSRQ items seem to capture social assertiveness versus shyness (e.g., “Would you be bothered if you had to return to a store when you noticed you were given the wrong change?”, ‘Do you generally avoid speaking in public?’) The content therefore appears to be more associated with extraversion–introversion, on which we would not expect a marked sex difference (Costa et al., 2001; Schmitt, Realo, Voracek, & Allik, 2008).

Moderator analysis. Only the effect sizes for punishment sensitivity as measured by the SPSRQ or GRAPES scales showed significant heterogeneity. Moderator analyses were performed on all categories. Age moderated the sex difference on the BAS Reward Scale, such that the sex difference was more pronounced in the 21-30 age group (d = –0.54) than the 18-21 age group (d = -0.16).

Variance ratios. Mean anti-log variance ratios can be found in Table 5. None are significantly different from 1.

Sensation Seeking and Risk Taking

Overall effect sizes. Table 6 reports effect sizes for the aggregated domain of sensation seeking and risk taking and the 13 measures it subsumes. For the domain general analysis, there were 130 independent effect sizes, of which five were estimated as zero. The d values for MPQ Harm Avoidance were reverse-scored before being combined with the other measures in this domain. The overall effect size was small to moderate in size, with significantly higher sensation seeking and risk taking among men (d = 0.41).

Turning to the measures subsumed in this domain, 10 of the 13 measures had significant sex differences and all reflected greater sensation seeking by men. The largest effect size was for MPQ and Personality Research Form (PRF; Jackson, 1994) measures of Harm Avoidance (d = –0.78). The MPQ Harm Avoidance questionnaire offers respondents a choice between two somewhat aversive activities from which they select the one that they would like to undertake less (e.g., “Having to walk around all day on a blistered foot” or “Sleeping out on a camping trip in an area where there are rattlesnakes”). High scorers prefer safer activities even if they are tedious and do not enjoy the excitement of adventure (Tellegen, 1982). This scale appeared to magnify the sex differences found on the similarly structured SSS Thrill & Adventure, which differs in offering a positive choice between two alternatives (e.g., “I would like to try surfboard riding” or “I would not like to try surfboard riding”).

Four of the measures showed moderate sex differences including I_7 Venturesomeness (d = 0.51); SSS Total (d = 0.50); SSS Disinhibition (d = 0.57); SSS Thrill & Adventure Seeking (d = 0.41); and UPPS Sensation Seeking (d = 0.49). Slightly lower effect sizes were found for Risk Taking (d = 0.38); Dickman Functional Impulsivity (d = 0.24); and Sensation Seeking Other Measures (d = 0.22). The ZKPQ ImpSS scale includes items separately assessing impulsivity and sensation seeking; and the effect size of .19 was non-significant with high heterogeneity (based on 4 studies). The two scales measuring intolerance of monotony showed small effect sizes; SSS Boredom Susceptibility (d = 0.20) and KSP Monotony Avoidance (d = 0.15). SSS Experience Seeking, which captures a desire for novel but safe activities, showed a non-significant effect size of .01. This provides more evidence that risk taking per se produces sex differences.

Moderator analysis. For most of the measures within the domain of sensation seeking and risk taking, there was significant heterogeneity. The exceptions were SSS Total, Risk Taking, KSP Monotony Avoidance and MPQ/PRF Harm Avoidance. Moderator analyses were performed for all measures (see Table 10).

The sex difference on Eysenck’s I_7 Venturesomeness scale appears to be moderated by age. With the exception of a small number of samples aged 30-40 (d = 0.84), the largest effect sizes are present in the 15-18 (d = 0.63) and the 18-21 (d = 0.54) age groups, with effect sizes in the other age groups ranging from 0.37 to

0.46. This suggests that, in general, the sex difference in Venturesomeness is largest in young adults. No other moderators were significant in this domain.

Variance ratios. Mean anti-log variance ratios can be found in Table 6. Only the variance ratio for SSS Disinhibition is significantly larger than 1 ($p < .01$), indicating greater male variability on this measure. Overall, there is little evidence for greater male then female variability within this domain.

Table 6

Sex differences (d) in measures of sensation seeking and risk taking

Measure	d	95% CI	K	N men	N women	Q	VR (*k*)
Eysenck Venturesomeness							
All studies	0.49	.43/.56	49	7443	10553	160.99 ***	0.91* (41)
Computed only[a]	0.51	.44/.57	47	7349	10395	146.80 ***	0.91* (41)
Outliers removed[b]	0.53	.47/.59	45	7267	10232	118.02***	0.91* (39)
SSS Total							
All studies	0.48	.41/.56	22	2563	3072	31.56	0.95 (17)
Computed only[c]	0.50	.43/.56	21	2541	2992	27.36	0.95 (17)
SSS Thrill & Adventure Seeking							
All studies	0.41	.29/.54	16	2761	3498	69.39 ***	0.85 (14)
SSS Experience Seeking							
All studies	0.01	-.11/.12	10	1406	2021	18.27*	1.04(8)
Computed only[d]	0.01	-.11/.12	9	1385	1998	18.27*	1.04(8)
SSS Disinhibition							
All studies	0.52	.40/.65	15	2286	3007	52.02***	1.26 (13)
Computed only[d]	0.54	.42/.66	14	2265	2984	48.73 ***	1.26 (13)
Outliers removed[e]	0.57	.46/.69	13	2204	2965	38.93 ***	1.37** (12)
SSS Boredom Susceptibility							
All studies	0.20	.09/.31	14	1922	2764	36.58***	1.07 (11)
UPPS Sensation Seeking							
All studies	0.48	.33/.63	15	1566	2284	62.44 ***	0.95 (11)
Computed only[f]	0.49	.34/.65	14	1552	2262	60.39 ***	0.95 (11)

Dickman Functional Impulsivity							
All studies	0.24	.08/.39	11	935	1346	27.59 **	1.04 (9)
ZKPQ Impulsive Sensation Seeking							
All studies	0.19	-.22/.60	4	623	706	58.30 ***	1.21(4)
KSP Monotony Avoidance							
All studies	0.15	-.00/.29	4	269	510	0.27	0.85 (4)
MPQ/PRF Harm Avoidance							
All studies	-0.78	-.92/-.64	3	334	528	0.11	0.91 (3)
Risk Taking							
All studies	0.36	.29/.44	11	3739	3330	25.66*	1.10* (7)
Computed only[g]	0.38	.31/.44	10	3659	3250	20.00	1.10* (7)
Sensation Seeking Other Measures							
All studies	0.21	.11/.30	24	5694	6748	236.92***	1.08 (23)
Computed only[h]	0.22	.13/.32	22	5432	6428	229.67***	1.08 (23)
Total of sensation seeking measures[i]							
All studies	0.39	.35/.43	130	23402	28914	578.23***	0.99 (169)
Computed only[j]	0.41	.37/.45	125	22952	28334	607.19***	0.99 (169)
Outliers removed[k]	0.41	.37/.45	123	22815	28154	274.42***	1.00 (164)

Note: Effect sizes are in the male direction if positive and in the female direction if negative. [a]Removed: Leshem & Glicksohn (2007); Reynolds et al. (2006a). [b]Removed (in order): Clarke (2004); Rim (1994). [c]Removed: Lennings (1991). [d]Removed: Lundahl (1995) [e]Removed: Curran (2006). [f]Removed: Verdejo-Garcia et al. (2007). [g]Removed: Sahoo (1985). [h]Removed: Lennings (1991); Overman et al. (2004). [i]Includes MPQ/PRF Harm Avoidance, reverse scored. [j]Removed: Lennings (1991); Leshem & Glicksohn (2007); Lundahl (1995); Overman et al. (2004); Reynolds et al (2006a); Sahoo (1985); Verdejo-Garcia et al. (2007). [k]Removed (in order): Copping (2007); Curran (2006: Sensation

Seeking Scale - Experience Seeking and Boredom Susceptibility; ZKPQ Impulsive Sensation Seeking); Lundahl (1995: Sensation Seeking Scale – Thrill and Adventure Seeking); McAllister et al. (2005); Weyers et al. (1995: age 27: TPQ Novelty Seeking).

* $p < .05$. ** $p < .01$. *** $p < .001$

CI = confidence interval; *Q* = homogeneity statistic; VR (k′) = mean variance ratio (number of effects from which variance ratios could be calculated).

Measures of General Impulsivity

Overall effect sizes. Although the domain general effect size (from 206 independent effect sizes, 180 of which were computed) was significant, it was extremely small in magnitude (d = 0.08), indicating slightly higher levels of impulsivity in men.

Table 7 shows the mean weighted effect sizes for each of the four measures included in this domain. There was no significant sex difference on Eysenck-based measures of impulsiveness. The KSP Impulsivity scale was also nonsignificant. Although the sex differences on the BIS-11 Total, (d = 0.12), and on Impulsivity Other Measures, (d = 0.13), showed men to be significantly more impulsive, the effect sizes were again small in magnitude.

Moderator analysis. For all measures within the domain of general impulsivity except the KSP Impulsivity measure, there was significant heterogeneity. Moderator analyses were performed on all measures (see Table 10). Population moderated the sex difference in KSP impulsivity. The two community samples showed a small but significant sex difference in the female direction (d = –0.18), but there was no sex difference in university samples.

Variance ratios. Mean anti-log variance ratios can be found in Table 7. None of them are significantly different from 1 at $p < .01$.

Table 7

Sex differences (d) in general measures of impulsivity

Measure	d	95% CI	K	N men	N women	Q	VR (*k*)
Eysenck Impulsiveness							
All studies	0.03	-.00/.07	100	14425	19680	222.72***	1.00 (74)
Computed only[a]	0.04	-.00/.08	88	13603	18768	222.27***	1.00 (74)
Outliers removed[b]	0.03	-.01/.07	82	13427	18584	183.63***	0.97 (68)
BIS Total							
All studies	0.11	.05/.16	58	6296	8452	115.14***	0.99 (42)
Computed only[c]	0.12	.06/.19	48	5729	7561	110.68***	0.99 (42)
Outliers removed[d]	0.12	.06/.18	47	5702	7548	105.88***	1.01 (41)
KSP Impulsivity							
All studies	-0.06	-.19/.07	7	826	4452	8.83	0.79* (5)
Computed only[e]	-0.06	-.21/.10	5	789	4318	8.38	0.79* (5)
Impulsivity Other Measures							
All studies	0.12	.07/.17	54	30040	31403	345.60***	1.02 (38)
Computed only[f]	0.13	.08/.19	47	29379	30575	344.99***	1.02 (38)
Outliers removed[g]	0.14	.08/.19	46	29354	30535	338.78***	1.02 (38)
Total of general impulsivity measures							
All studies	0.07	.05/.10	206	50805	62428	244.52***	1.00 (159)
Computed only[h]	0.08	05/.11	180	48862	59859	359.28***	1.00 (159)
Outliers removed[i]	0.08	.05/.11	173	48688	59683	131.42*	0.98 (153)

Note: Effect sizes are in the male direction if positive and in the female direction if negative. [a]Removed: Allen et al. (1998); Brown et al. (2006); Deffenbacher et al. (2003); Doran et al. (2007a); Keilp et al. (2005); Ketzenberger & Forrest (2000); Leshem & Glicksohn (2007); Reynolds et al. (2006a); Reynolds et al. (2007); Van den Broek et al. (1992). [b]Removed (in order): Weyers et al. (1995: age 50); Saklofske & Eysenck (1983: age 15); Weller (2001);

Starrett (1983: Senior high); Corr et al. (1995); Lopez Viets (2001). [c]Removed: Allen et al. (1998); Chung & Martin (2002); Dinn et al. (2002); Hulsey (2000); Jack & Ronan (1998); Leshem & Glicksohn (2007); Nagoshi et al. (1994); Neubauer (1992); Patock-Peckham et al. (1998); Reynolds et al. (2006a); Rigby et al. (1992); Van den Broek et al. (1992). [d]Removed: Clark et al. (2005). [e]Removed: Lennings (1991); Lennngs & Burns (1998). [f]Removed: Allen et al. (1998); Bembenutty & Karabenick (1998); McMahon & Washburn (2003); Overman et al. (2004); Plouffe & Grawelle (1989); Rhyff et al. (1983); Schweizer (2002). [g]Removed: Malle & Neubauer (1991). [h]Removed: Allen et al. (1998); Bembenutty & Karabenick (1998); Brown et al. (2006); Chung & Martin (2002); Deffenbacher et al (2003); Dinn et al. (2002); Doran et al. (2007a); Hulsey (2000); Jack & Ronan (1998); Keilp et al. (2005); Ketzenberger & Forrest (2000); Lennings (1991); Lennngs & Burns (1998); Leshem & Glicksohn (2007); McMahon & Washburn (2003); Nagoshi et al. (1994); Neubauer (1992); Overman et al. (2004); Patock-Peckham et al. (1998); Plouffe & Grawelle (1989); Reynolds et al. (2006a); Reynolds et al. (2007); Rhyff et al. (1983); Rigby et al. (1992); Schweizer (2002); Van den Broek et al. (1992). [i]Removed (in order): Weyers et al. (1995; 50-year olds); Clark et al. (2005); Saklofske & Eysenck (1983: 15-year olds); Malle & Neubauer (1991); Weller (2001); Starrett (1983: Senior High sample); Corr et al. (1995).

* $p < .05$. ** $p < .01$. ***$p < .001$

CI = confidence interval; *Q* = homogeneity statistic; VR (k′) = mean variance ratio (number of effects from which variance ratios could be calculated).

Specific Forms of Impulsivity

Overall effect sizes. Nine measures of specific forms of impulsivity were analysed, with a total of 128 independent effect sizes (111 of which were computed) from 56 studies. Table 8 shows the mean weighted effect sizes for these measures. For most of the measures, there was no sex difference. There were significant but small sex differences in the male direction on BIS-11 Cognitive Impulsivity (d = 0.13), indicating men's greater difficulty in concentrating and focusing attention; on BIS-11 Non-Planning (d = 0.15), suggesting men's lesser tendency to consider the future; and on Dickman's Dysfunctional Impulsivity (d = 0.12), which captures a failure of premeditation resulting in negative consequences. There was a small to moderate effect size on Impulsivity/Carelessness in the Social Problem-Solving Inventory (d = 0.32), indicating that men are more likely than women to rush into ill-considered "solutions" to interpersonal problems. There was also a small but significant sex difference in the female direction on UPPS Urgency (d = –0.10), indicating that women are more likely to report that their impulse control is disrupted by negative affect or that they feel regret for their impulsive actions. The overall picture is that there are weak, inconsistent sex differences in these specific forms of impulsivity.

Moderator analysis. For most of the specific measures of impulsivity, there was significant heterogeneity in the effect sizes. The exceptions were UPPS Premeditation, UPPS Urgency, Dickman Dysfunctional Impulsivity, and the Social Problem-Solving Inventory. Moderator analyses were performed for all measures. Table 10 presents those categorical variables that were found to have a significant moderating effect on the sex difference.

The sex difference in BIS Non-Planning was moderated by geographical area, with samples from the US, Canada, and Central America showing a moderate sex difference in the male direction (d =0.30), and samples from the UK, Europe, Australia, and New Zealand showing no sex difference. The sex difference in UPPS Perseverance was moderated by age: The sex difference in the male direction appears only in samples aged over 21 (d = 0.38). In UPPS Urgency, age also moderated the magnitude of the sex difference in an inconsistent fashion. Here, an effect size in favour of women was confined to the age 15–18 age group (d = –0.31).

The significant moderation by population sampled may be an artifact of this age effect; the effect size was significant and in the female direction for the school samples, (d = –0.26), but not for undergraduate samples.

The sex difference in Impulse Control also appears to be moderated by age, but in an inconsistent fashion. The two samples aged 15-18 show roughly equal sex differences in opposite directions, resulting in an overall null result; samples aged 18-21 show a sex difference in the male direction (d = 0.40); whereas samples aged over 21 show a small sex difference in the female direction (d= -.17). Geographical area also appears to moderate the sex difference in impulse control: The two samples from the UK, Europe, Australia and New Zealand show a substantial sex difference in the female direction (d = - 0.55), while those from the US, Canada, and Central America show a small sex difference in the male direction (d = 0.17).

Variance ratios. Mean anti-log variance ratios can be found in Table 8. None were significantly different from 1.

Table 8

Sex differences (d) in measures of specific forms of impulsivity

Category	d	95% CI	k	N men	N women	Q	VR (k)
BIS Cognitive							
All studies	0.13	.00/.26	18	1776	2372	56.79***	0.92 (16)
BIS Motor							
All studies	0.08	-.00/.17	19	2990	3620	34.09*	1.04 (13)
BIS Non-planning							
All studies	0.15	.06/.24	20	3187	3839	43.31 **	0.96 (17)
UPPS Perseverance							
All studies	0.05	-.07/.17	14	1449	2111	34.27**	0.93 (12)
Computed only[a]	0.05	-.08/.17	13	1435	2089	34.26***	0.93 (12)
UPPS Premeditation							
All studies	-0.01	-.08/.06	14	1449	2111	7.77	1.06 (12)
Computed only[a]	-0.01	-.08/.06	13	1435	2089	7.77	1.06 (12)
Outliers removed[b]	-0.00	-.07/.07	12	1423	2031	3.40	1.00 (11)
UPPS Urgency							
All studies	-0.10	-.19/-.01	14	1449	2111	19.15	.94 (12)
Computed only[a]	-0.10	-.19/-.01	13	1435	2089	19.06	.94 (12)
Dickman Dysfunctional Impulsivity							
All studies	0.12	.02/.23	12	1107	1518	16.58	.91 (10)
Impulse Control							
All studies	0.02	-.22/.25	11	1303	1767	92.15***	0.85 (9)
Computed only[c]	0.02	-.23/.26	10	1277	1743	92.09***	0.85 (9)

Category	d	95% CI	k	N men	N women	Q	VR (k)
Social Problem Solving Inventory (SPSI)							
All studies	0.23	.09/.37	6	990	1850	11.37*	1.05 (5)
Computed only[d]	0.32	.23/.41	5	869	1199	2.80	1.05 (5)

Note: Effect sizes are in the male direction if positive and in the female direction if negative.

[a]Removed: Verdejo-Garcia et al. (2007). [b]Removed: Anestis et al. (2007). [c]Removed: Fox et al. (2007). [d]Removed: Maydeu-Olivares et al. (2000).

* $p < .05$. ** $p < .01$. ***$p < .001$

CI = confidence interval; *Q* = homogeneity statistic; VR (*k*) = mean variance ratio (number of sample sizes from which variance ratios could be calculated)

Behavioural Measures of Impulsivity

Overall effect sizes. The 48 studies in this domain produced 64 independent effect sizes, of which 43 were computed. Effect sizes are presented in Table 9. A significant sex difference, moderate in size and in the male direction, was found on the BART (d = 0.36). This suggests that men are willing to continue the pursuit of a reward in the face of increasing risk for a longer time than women. Because the BART is a measure of risk taking, it is not surprising that the significant sex difference is consistent with those found in the general domain of sensation seeking and risk taking.

On the IGT, men were found to perform significantly better (i.e., less impulsively) than women (d = -0.34). This finding is in contradiction to developmental and evolutionary predictions relating to effortful control, suggesting that women are less able than men to resist a monetary reward in the short term in order to avoid a greater monetary loss later. However, it should be noted that the IGT was not designed to assess impulsivity but decision making. Bechara, Damasio, Damasio, and Anderson (1994, p. 8) noted that a patient who performed poorly on the IGT due to damage to the prefrontal cortex was “not perseverative, nor is he impulsive.” Men’s superior performance on this task may actually be the consequence of women’s greater punishment sensitivity: There is evidence that women prefer an IGT strategy that minimises the frequency of punishment, even though this may be disadvantageous in the long run (Goudriaan, Grekin, Sher, 2007). This argument raises questions about the validity of attributing poor performance on this task uniquely to impulsivity. Delay discounting, also used as a measure of the propensity to resist small short-term rewards as part of a long-term strategy, showed no sex difference. Although this result is consistent with our finding that general measures of impulsivity did not differ between the sexes, we note that delay discounting measures only one of the many facets thought to be subsumed by the construct of impulsivity (C. L. Smith & Hantula, 2008). Correlations between delay discounting and psychometric measures of impulsivity are typically weak (Reynolds, Richards et al., 2006; C. L. Smith & Hantula, 2008)

Where impulsivity is inferred from errors on visual-cognitive tasks, a sex difference in the female direction is found ($d = -0.26$). The use of visuospatial tasks to infer impulsivity also raises problems of validity. These measures were not developed as measures of impulsivity but as tests of, among other things, spatial ability (the Spatial Orientation Dynamic Test–Revised; Quiroga et al, 2007); intelligence (The Porteus Maze; Porteus, 1950; The Tower of London Test; Shallice, 1982); and visual attention (the Trail Making Test; Reitan, 1958). Although the Matching Familiar Figures Test was developed to measure a form of impulsivity, concerns about its construct validity have been raised before (Block et al, 1974). Attributing errors on visuospatial tasks to impulsivity may be particularly misleading where sex differences are of interest: the sex difference in visuospatial ability is one of the most robust in the literature (Voyer, Voyer, & Bryden, 1995), so a sex difference on these tasks might well be related to this difference in ability rather than impulsivity.

Consistent with Bjorklund and Kipp's (1996) review, no sex differences were found where impulsivity assessment was based on executive response inhibition tasks. As outlined in previous sections, these included Stroop tasks, the Stop Signal task, and the Go/No-Go task. These tasks are not direct measures of impulsivity but of attention (MacLeod, 1991), inhibitory motor control (Band & van Boxtel, 1999), and passive avoidance learning (Newman, Widom, & Nathan, 1985), respectively. Correlations between these measures and psychometric measures of impulsivity are often weak or absent (Casillas, 2006: Enticott et al, 2006; Reynolds, Ortengren, et al, 2006; Reynolds, Richards, et al, 2006; Rodriguez-Fornells, Lorenzo-Seva, & Andres-Pueyo, 2002; but see Logan, Schachar, & Tannock, 1997). It has been suggested that performance on the Stop Signal task may be impaired only when trait impulsivity is exceptionally high (Enticott et al., 2006), so that using it to infer impulsivity in normal populations may be problematic.

Moderator analysis. Moderator analyses were conducted for the BART, delay discounting, and executive response inhibition (there were too few studies for moderator analyses related to the IGT or the visuospatial tasks). The results are presented in Table 10. Although small numbers of studies mean that these results must be interpreted with caution, both the analysis by age and the analysis by population suggest that the sex difference in measures of impulsivity based on executive response inhibition is moderated by age. A sex difference in the male direction is present in younger samples (age 10-15 years, d = 0.71; school samples, d = 0.62), while older samples (21-30 years) show no significant sex difference or a small sex difference in the female direction (community samples, d = –0.18). This pattern suggests that, on these tasks, boys may lag behind girls in their ability to inhibit prepotent responses earlier in life, before catching up later on.

Variance ratios. Mean anti-log variance ratios can be found in Table 9. Men were found to vary more widely than women on Stroop-related tasks. No other variance ratios were significantly different from 1.

Publication bias

As noted earlier, sex differences were not the object of study in most of the studies retrieved for this meta-analysis, reducing the likelihood of publication bias. Moderator analysis using publication status as a moderator variable found no evidence that effect sizes differed between published and unpublished studies. Furthermore, rank correlations between standard error and effect size were not significant (see Table 11). Although in some domains there were insufficient studies to test for publication bias, the tests that could be conducted revealed no evidence for publication bias.

Table 9

Sex differences (d) in behavioural measures of impulsivity

Category	d	95% CI	k	N men	N women	Q	VR (k′)
Executive response inhibition							
All studies	0.13	-.04/.30	19	863	974	84.54***	0.94 (19)
Computed values only[a]	0.21	-.06/.48	10	592	647	83.21***	0.94 (19)
Visual-cognitive tasks							
All studies	-0.20	-.37/-.04	7	1558	1408	172.46***	0.92 (8)
Computed values only[b]	-0.26	-.43/-.08	6	1499	1285	156.43***	0.92 (8)
Iowa Gambling Task							
All studies	-0.19	-.35/-.03	7	602	725	15.56*	-
Computed values only[c]	-0.34	-.48/-.20	4	380	420	4.31	-
Delay Discounting							
All studies	-0.08	-.19/.02	21	905	882	40.52	0.95 (17)
Computed values only[d]	-0.07	-.22/.07	15	783	751	39.70*	0.95 (17)
BART							
All studies	0.30	.11/.49	10	265	311	21.12*	1.37 (3)
Computed values only[e]	0.36	.16/.57	8	220	266	18.93*	1.37 (3)

Note: Effect sizes are in the male direction if positive and in the female direction if negative. [a]Removed: Acheson et al. (2007); Brown et al. (2006); de Wit et al. (2002); Feldman (1999); Keilp et al. (2005); Marczinski et al. (2007); Reynolds et al. (2006a); Tinius (2003); Walderhaug (2007). [b]Removed: Leshem & Glicksohn (2007). [c]Removed: Davis et al. (2007); Goudriaan et al. (2007); Jollant et al. (2005). [d]Removed: Acheson et al (2007); Allen et al. (1998); de Wit et al. (2002); Kollins (2003). [e]Removed: Acheson et al (2007); Reynolds (2003); Reynolds et al. (2004); Reynolds et al. (2006a).

* $p < .05$. ** $p < .01$. *** $p < .001$

CI = confidence interval; *Q* = homogeneity statistic; VR (k′) = mean variance ratio (number of effects from which variance ratios could be calculated).

Table 10

Categorical analysis of all measures, grouped by domain

Measure and category	d (95% CI)	Q_W	k	Q_B
General Impulsivity Measures				
Eysenck Impulsiveness				
Age				12.77*
10-15 years	0.07 (-0.01/0.15)	13.88	12	
15-18 years	0.06 (-0.09/0.20)	40.90 ***	11	
18-21 years	0.03 (-0.02/0.09)	45.51*	27	
21-30 years	0.09 (0.02/0.16)	37.52*	23	
30-40 years	-0.06 (-0.34/0.23)	14.14 **	5	
40+ years	-0.21 (-0.37/-0.05)	7.79	5	
BIS Total				
Geographical Area				6.71*
US, Canada & Central America	0.18 (0.09/0.26)	68.46 ***	32	
UK, Europe & Aus/NZ	0.05 (-0.04/0.13)	17.01	13	
Asia, Africa, Middle East	0.04 (-0.03/0.11)	0.64	3	
KSP Impulsivity				
Population				7.26 **
University Students	0.07 (-0.09/0.23)	0.86	4	
Community	-0.18 (-0.27/-0.09)	0.69	2	
Geographical area				6.56*
US, Canada & Central America	0.09 (-0.09/0.26)	0.69	2	
UK, Europe & Aus/NZ	-0.17 (-0.25/-0.08)	1.59	5	

Measure and category	d (95% CI)	Q_W	k	Q_B
Specific Measures of Impulsivity				
BIS Non-planning				
Geographical Area				17.26 ***
US, Canada & Central America	0.30 (0.20/0.40)	11.11	11	
UK, Europe & Aus/NZ	0.02 (-0.07/0.11)	7.80	8	
UPPS Perseverence				
Age				13.99 **
15-18 years	-0.03 (-0.16/0.11)	0.48	2	
18-21 years	-0.01 (-0.18/0.15)	15.12*	7	
UPPS Urgency				
Population				6.85**
University Students	-0.03 (-0.14/0.07)	10.38	9	
Schools (up to age 18)	-0.26 (-0.14/0.07)	0.18	2	
Age				15.62 ***
15-18 years	-0.31 (-0.45/-0.17)	0.56	2	
18-21 years	0.02 (-0.07/0.12)	1.88	7	
21-30 years	-0.14 (-0.32/0.04)	0.41	3	
Geographical area				6.66*
US, Canada & Central America	-0.04 (-0.14/0.07)	10.42	9	
UK, Europe & Aus/NZ	-0.24 (-0.36/-0.12)	0.85	4	
Sex of first author				5.93*
Female	-0.02 (-0.14/0.10)	9.55	7	
Male	-0.22 (-0.33/-0.11)	1.71	6	

Measure and category	d (95% CI)	Q_W	k	Q_B
Impulse control				
Age				21.98 ***
15-18 years	0.00 (-0.74/0.74)	26.33 ***	2	
18-21 years	0.40 (0.27/0.54)	2.43	3	
21-30 years	-0.17 (-0.36/0.03)	0.36	2	
Geographical Area				9.18 **
US, Canada & Central America	0.17 (-0.02/0.35)	32.40 ***	8	
UK, Europe & Aus/NZ	-0.55 (-0.98/-0.13)	4.19*	2	
Sensation seeking and risk taking				
I_7 Venturesomeness				
Age				26.12 ***
10-15 years	0.46 (0.35/0.58)	18.84*	9	
15-18 years	0.63 (0.44/0.81)	0.82	3	
18-21 years	0.54 (0.43/0.65)	27.99 **	11	
21-30 years	0.46 (0.33/0.58)	51.37 ***	60	
30-40 years	0.84 (0.70/0.98)	1.33	3	
40+	0.37 (0.21/0.53)	4.29	4	
Reward and Punishment Sensitivity				
BAS Reward				
Age				9.75**
18-21 years	-0.16 (-0.29/-0.04)	6.35	5	
21-30 years	-0.54 (-0.73/-0.34)	0.02	2	

Measure and category	d (95% CI)	Q_w	k	Q_B
Behavioural measures of impulsivity				
BART				
Age				6.65*
10-15 years	0.43 (0.02/0.85)	1.15	2	
18-21 years	0.57 (0.30/0.85)	0.12	3	
21-30 years	0.02 (-0.30/0.34)	0.65	3	
Executive Response Inhibition				
Population				17.37 ***
Community	-0.17 (-0.40/0.06)	0.82	4	
Schools (up to age 18)	0.62 (0.46/0.78)	7.58	4	
University Students	0.05 (-0.18/0.28)	0.35	2	
Age				30.69 ***
10-15 years	0.71 (0.51/0.92)	0.22	2	
15-18 years	0.32 (-0.36/1.01)	5.34*	2	
21-30 years	-0.19 (-0.44/0.05)	0.47	3	

Note: Only significant moderators are shown.

* $p < .05$. ** $p < .01$. ***$p < .001$

Q_W = total within-group variance. Q_B = variance between contrasted categories.

Table 11

Evaluation of evidence for publication bias using moderator analysis by publication status and rank correlation between standard error and effect size.

Domain/measure	Effect size (95% CI) by publication status					Rank Correlation	k	Evidence for publication bias
	Published	k	unpublished	k	Q_B			
General impulsivity								
Whole domain	0.07 (0.04/0.10)	159	0.14 (0.04/0.25)	21	1.61	0.01 (p = .45)	180	None
I_7 Impulsiveness	0.03 (-0.01/0.08)	80	0.11 (-0.04/0.26)	8	0.92	0.02 (p = .39)	88	None
BIS Total	0.12 (0.06/0.19)	44	0.06 (-0.13/0.25)	4	0.43	0.10 (p = .16)	48	None
Impulsivity Other Measures	0.12 (0.06/0.18)	38	0.19 (0.04/0.34)	9	0.67	-0.01 (p = .44)	47	None
Specific measures of Impulsivity								
BIS Non-planning	–	–	–	–	–	0.06 (p = .36)	20	None
Sensation seeking and risk taking								
Whole domain	0.39 (0.34/0.44)	107	0.37 (0.22/0.53)	17	0.05	-0.05 (p = .20)	127	None
I_7 Venturesomeness	0.51 (0.44/0.57)	44	0.58 (0.03/1.13)	3	0.07	-0.01 (p = .45)	49	None
SSS Total	0.52 (0.44/0.60)	16	0.45 (0.31/0.60)	4	0.64	-0.09 (p = .29)	20	None
Sensation Seeking Other Measures	–	–	–	–	–	-0.09 (p = .26)	23	None

Note: dashes indicate insufficient studies for analysis by group. The domains of reward sensitivity, punishment sensitivity, and behavioural measures were too small to evaluate. All p values are one-tailed.

Discussion

We organise our discussion in terms of the theoretical distinction made in the Introduction between lower-order (reward and punishment sensitivity) and higher-order (effortful control) theories of impulsivity. We then consider sex differences in variance ratios. We end with a summary and suggestions for future developments in the field.

Reward and Punishment Sensitivity in relation to Sensation Seeking

The aggregate measure of reward sensitivity showed no significant sex difference. However it appears that the various measures within this domain are measuring quite different constructs. On the TCI, items refer specifically to social sensitivity and attachment, and the effect size favouring women probably reflects the greater salience of this domain to women. This pattern may also hold true for the BAS Reward Scale, where much emphasis is placed on the strength of emotional responses to positive events. There is evidence that women experience emotions more intensely than men and are more willing to articulate them (Brebner, 2003: Vigil, 2009), which may account for women's higher scores. In contrast, the SPSRQ and GRAPES scales emphasise strong pursuit of reward, particularly in the form of money or status, and here a sex difference favouring men is observed. This sex difference fits well with the predictions outlined in the introduction regarding men's greater approach motivation in the pursuit of dominance.

Where sex differences in reward sensitivity are of theoretical interest, the choice of reward sensitivity measure is crucial. It is essential to consider what, if any, particular form of reward is most relevant. It must also be made clear whether sensitivity to reward refers to the extent to which reward is liked, or the extent to which reward is pursued. Our data suggest that this subtle difference in operationalising sensitivity can lead to sex differences in opposite directions.

Measures of punishment sensitivity were consistently in the female direction. Although the differences between measures were less dramatic than for reward sensitivity, we found again that measures with a stronger emphasis on emotion produced larger sex differences in the female direction. This finding suggests that the extent to which we observe sex differences in punishment sensitivity depends on the extent to which measures refer specifically to fear and anxiety, rather than to general dislike or avoidance. As with reward sensitivity, the selection of the appropriate instrument to measure punishment sensitivity will depend on the context of the research.

Explanations of sensation seeking and risk taking have drawn on these lower order theories in terms of affective and neurochemical responses to prospective reward and punishment. It is in the domain of sensation seeking that sex differences were most marked. Sensation seeking is a trait characterised by strong affective motivation – unlike impulsivity, where the presence of affective motivation is ambiguous. We propose that sensation seeking, along with its cousins novelty seeking, risk taking, fun seeking, venturesomeness, and reversed harm avoidance, constitute a distinctive trait that should not be subsumed under the general concept of impulsivity. At a conceptual level, Zuckerman's (1979) definition of sensation seeking makes no reference to acting without deliberation. Zuckerman (1994) himself has noted that parachute jumpers do not jump from planes on impulse; they plan carefully, checking their equipment, drop site, parachute, and timings. As operationalised in most self-report questionnaires, sensation-seeking items do not make reference to the failure of deliberation, which is the hallmark of impulsive action. Empirically, impulsivity and sensation seeking frequently appear as distinct factors in multivariate analyses. Reviewing 11 factor-analytic studies of major personality scales, Depue and Collins (1999) found that sensation-seeking, novelty-seeking, and risk-taking scales showed a distinct clustering and were only loosely associated with scales measuring ‘nonaffective’ impulsivity. Several other studies using a range of impulsivity scales have also identified a factor of sensation seeking distinct from other aspects of impulsivity (Flory, Harvey, Mitropoulou, New, Silverman, Siever et al., 2006; Magid & Colder, 2007; Miller, Joseph & Tudway, 2004; Smith et al., 2007; Whiteside & Lynam, 2001; Zelenski & Larsen, 1999). That sensation seeking loads on a distinct dimension argues as much for its statistical and conceptual distinctiveness as it does for its status as a facet of impulsivity. In the present analysis, it was noticeable that sex differences were considerably weaker on the ZKPQ ImpSS than on the SSS-V. When factor-analysed, ImpSS splits into its two constituent factors of impulsivity and sensation seeking (Zuckerman and Kuhlman, 1993). This may account for the dilution of the effect size on this measure, with weaker sex differences in impulsivity counteracting the stronger sex differences in sensation seeking.

Within the domain of sensation seeking and risk taking, we found some encouraging evidence of consistency between psychometric and behavioural measures. The BART task was developed as a measure of risk taking (Lejuez, Read, Kahler, Richards, Ramsey, Stuart, et al, 2002), and there is good evidence for its construct validity (Aklin, Lejuez, Zvolensky, Kahler, & Gwadz, 2005; Hunt, Hopko, Bare, Lejuez, & Robinson, 2005). It is not surprising that this task shows a significant sex difference in the male direction. Unlike the behavioural tasks that measured a failure to inhibit a prepotent response, the BART measures the active pursuit of reward. In a factor analytic study, the BART has been found to be distinct from executive inhibition tasks (Reynolds, Ortengren et al., 2006). This finding adds to the empirical evidence for a distinction between impulsivity and risk taking.

Evolutionary theories, predicated on differential parental investment, predict higher risk taking by males and these are supported by the current review. Greater male risk taking is not unique to our species, and such a conserved and sex-specific evolutionary adaptation is likely to be instantiated at a relatively low level in terms of neural structure. Emotional and motivational factors are sufficient to generate individual differences in appetite for and aversion to risk. Within the evolutionary framework, a distinction can be drawn between Campbell's (1999) argument that women are more sensitised than men to negative outcomes (punishment sensitivity) and Daly and Wilson's (1988) argument that men experience a greater positive attraction to risk (reward sensitivity).

Campbell's position is supported by our finding that women were consistently higher in measures of punishment sensitivity. Women's risk aversion was evident also in their markedly higher scores on MPQ Harm Avoidance. On this measure, in which respondents choose the less objectionable of two aversive activities, the effect size (d = –0.78) is almost twice as big as that found on the SSS Thrill and Adventure scale (d = 0.41), which offers an appetitive choice regarding engagement in risky activities. This finding suggests that women may be even more prone to avoid risky activities than men are to seek them out.

In a meta-analysis of sex differences in risk taking, Byrnes et al. (1999) found greater risk taking by men over a range of paradigms but these were most marked in studies involving real rather than hypothetical risk. In reference to the distinction between higher level cognitive and lower level motivational processes, they note "the processes involved in the transition of cognitions to behaviours (e.g. fear responses) may explain gender differences in risk taking more adequately than the cognitive processes involved in the reflective evaluation of options" (Byrnes et al., 1999, p.378). They propose that these lower level motivational factors may play as strong a role as cognition in risky decision making. This "risk as feelings" idea was developed by Loewenstein, Weber, Hsee, and Welch (2001), who noted that emotional reactions to risk can and frequently do occur without cognitive intervention, and that sex differences in fear and anxiety underlie women's more cautious, risk-averse decisions (Lerner & Keltner, 2000). In the areas of health maintenance and extreme sports (Harris, Jenkins & Glaser 2006), which present real threats to physical integrity, the sex difference in risk taking is best explained by women's greater anticipation of negative consequences and by their higher ratings of the severity of those negative consequences should they occur.

Although Campbell originally predicted women's greater fear specifically in the context of prospective physical injury, many studies have now demonstrated greater fear and anxiety in women across a range of contexts (see Campbell, 2006). Women exceed men cross-culturally on the Vulnerability ($d = -0.43$) and Anxiety facets ($d = -0.36$) of the NEO-R (Costa et al., 2001). Anxiety is strongly linked to a lower threshold for detecting and attending to threat, and experimental studies demonstrate this threshold to be lower in women than in men (McLean & Anderson, 2009).

Daly and Wilson's (1988) complementary thesis emphasises men's greater attraction to risk. In this view, men engage in more dangerous activities as a result of the inherent attractions of the activities (e.g., scuba-diving, parachute jumping). Although it is evident why potentially life-threatening activities might promote fear and avoidance, it is less clear why some individuals should find them inherently attractive. Daly and Wilson argued that men use such activities to advertise their courage as part of intrasexual competition, thus gaining greater reproductive success; this masculine taste-for-risk therefore represents an evolved module. Consistent with this is Zuckerman’s (1994) argument that the physiological arousal resulting from such activities signals reward in the brain. Although measures of reward sensitivity do not provide unanimous support for this appetitive view, we note that men’s scores do exceed women’s where questionnaire items focus on competitive dominance striving.

The attraction of risky activities to men, however, need not depend upon heightened male sensitivity to reward but can be explained in terms of their lower punishment sensitivity as follows (Campbell, 2002). Typically an inverted U-shaped function describes the relationship between the arousal (low–high) generated by an activity and its subjective hedonic valence to the actor (pleasant–unpleasant). If men have a higher fear threshold, their function will be right-displaced relative to women’s. Hence a higher degree of arousal will be necessary to generate the same degree of pleasure. Men will show a shift from enjoyment to excitement (and from apprehension to fear) at higher levels of arousal compared to women. Hence a high-speed car ride that is unpleasant (aversive) to women could be exciting (attractive) to men.

Effortful control

We consider general measures, specific forms of impulsivity, and behavioural measures as assessing higher order or effortful control, as they presuppose an explicit, conscious decision with regard to action or inaction. The sex difference in general measures of impulsivity, although statistically significant, was small in magnitude. The most widely used psychometric measure of general impulsivity, Eysenck's I_7 Impulsiveness questionnaire, showed no significant sex difference. The analysis of specific measures added to the picture of weak, inconsistent sex differences in impulsivity. Measures of behavioural impulsivity were very inconsistent, with some suggesting greater female impulsivity, some suggesting greater male impulsivity, and some showing no sex difference. This inconsistency is likely to be related to variation in the constructs measured by these tasks. Within the domain of higher order processes, it is relevant to highlight the distinction between "hot" effortful control and "cool" executive function control (Ardila, 2008; Happanay, Zelazo & Stuss, 2004; MacDonald 2008). Both are higher order processes governing subcortical processes.

Executive function governs cognition in emotionally neutral conditions and has been localised to the dorsolateral prefrontal cortex (Cummings 1993; Fuster, 1997). Many of the behavioural tasks included in our analysis assess this kind of inhibition, where impulsivity is manifested in an inability to inhibit motor responses, maintain attention, develop and execute a plan, or switch to a new dimensional set. Executive functions of this kind are correlated with general intelligence, where sex differences are likely to be minimal (Jensen, 1998). Our analysis indicates that sex differences are non-significant on these cool, executive function tasks (Stroop, Go/No-Go, Stop, CPT). The Delay Discounting Task also showed no sex difference. Although this task involves monetary incentives and might, therefore, be considered an affective task, we suggest that it relies primarily on the 'cooler' executive form of decision-making. In most studies, participants' choices are entirely hypothetical, because the high sums involved (e.g. $1,000) make it impossible to honour their choices. In other studies, participants are told there is a small (e.g., 10%) probability that one of their choices might be honoured (e.g. McLeish & Oxoby 2007), or one trial is randomly selected for payment (e.g. Reynolds, Richards et al., 2006). Given that participants make as many as 400 sequential choices, it is clear that the task has a strong hypothetical component. Hypothetical decisions draw on 'cooler' cognitive forms of decision-making, which are assumed to be based on rationality and expected utility theory (Loewenstein, Weber, Hsee, & Welch, 2001; Madden, Begotka, Raiff & Kastern, 2003). In their meta-analysis, Byrnes, Miller, and Schafer (1999) found a very small tendency for men to make riskier decisions in these hypothetical choice-dilemma tasks (d = 0.07).

Although women demonstrated higher 'impulsivity' in visual-cognitive tasks, this result should be treated with caution. Most of these tasks were not originally designed to assess impulsivity. By employing number of errors as the measure of impulsive responding, they conflate men's established superior visual spatial abilities with lower impulsivity (Voyer, Voyer, & Bryden, 1995). The findings from the IGT should also be treated with caution since, as we have noted, this was not originally designed as an impulsivity measure (Bechara et al., 1994) and the sex difference may reflect women's greater punishment sensitivity (Goudriaan et al., 2007).

Hot forms of inhibition refer to control over social and affective processes – the effortful control system. It has been localised to the orbitofrontal region of the prefrontal cortex, which has bidirectional connections with limbic system structures, notably the amygdala (Davidson, Putnam & Larson, 2000; Rolls, 2000). There is suggestive, though not yet conclusive, evidence that women may have an advantage in affective inhibition: women have greater binding potential for serotonin in several regions including the amygdala and orbitofrontal cortex (Parsey et al., 2002). They also have greater orbitofrontal volume (Goldstein et al., 2001; Wood, Heitmiller, Andreason & Nopoulos, 2008) and greater functional connectivity between the OFC and the amygdala (Meyer-Lindenberg, Buckholtz, Kolachana, Hariri, Pezawas, Wabnitz et al., 2006). Following MacDonald's (2008) and R. Baumeister's (personal communication, February 18, 2010) argument that men's appetitive impulses are less amenable to cortical over-ride than women's, we anticipated sex differences in effortful control

The weak sex difference that we found (d = 0.08) begs the question of the extent to which psychometric impulsivity measures are accessing hot versus cold inhibitory control. This is not easy to determine. Questions of the kind "I am an impulsive person" do not indicate whether the relevant context is affectively loaded or neutral. Some respondents might interpret this item as referring to affectively hot contexts such as a love affair or an argument, whereas others might think of a cool context such as an ill-considered chess move. Any tendency for men to interpret items in one way and women in another could distort or obscure sex differences. Future studies could usefully examine whether sex differences are systematically moderated by the requirement for hot – as opposed to cool – behaviour control. This endeavour would entail clearer exposition of the factors that render a decision 'affective' rather than emotionally neutral. Consider an item such as "I plan tasks carefully." A negative response to this item might reflect a deficit in the cool executive ability to plan or a social-affective hot preference for spontaneity over predictability.

Nonetheless, the management of social interactions appears to be a strong candidate for affective effortful control. In accord with Bjorklund and Kipp's (1996) proposal, men are more impulsive than women in social problem solving. Whereas this tendency may, as Bjorklund and Kipp suggest, derive from the evolutionary advantages accruing to women who could suppress and conceal emotion toward others, it is also consistent with women's greater interpersonal interests. Women have been credited with more sensitive social skills and with a stronger interpersonal orientation than men (Cross & Madson, 1997; Hall, 1984; Horgan, Mast, Hall & Carter, 2004; Su, Rounds & Armstrong, 2009). It may be that their superior performance results from a stronger dependence on, and motivation to sustain, social relationships. This advantage might derive from evolutionary pressures associated with survival and childcare (S. E. Taylor et al., 2000).

The distinction between executive function and effortful control might reflect more than simply the presence or absence of an affective component. Performance on executive function tasks is often referred to in terms of ability or deficit, implying degrees of competence; impulsive actions are seen as failures of effortful control. As with intelligence, more executive function is better than less. According to this view, sex differences in effortful control will produce male overrepresentation in problem behaviour due to men's greater propensity for failure to act in a controlled manner. It is not clear, however, that effortful control should be viewed in this way. An overly strong effortful control system is associated with internalising behaviour problems (Murray & Kochanska, 2002). Rather than a competence, effortful control might be best conceptualised as a personality style. In this case, actions that we construe as impulsive represent a preference that might in some circumstances be beneficial (Carver, 2005; Dickman, 1991; MacDonald, 2008). Stable individual differences will exist in the tendency to make a particular kind of choice, such as spontaneity versus restraint. As with other personality traits (Penke, Denissen, & Miller, 2007), effortful control may be neither an unalloyed good nor an absolute hindrance; it may simply be something that varies between people. According to this trait view of effortful control, a sex difference in effortful control could account for both the overrepresentation of men and boys in externalising pathologies and the overrepresentation of women and girls in internalising ones. Understanding whether sex differences in effortful control represent competency failures or personality traits is important in addressing sex-linked social problems including aggression, substance misuse, and accidental deaths.

Our weak and inconsistent results for effortful control contrast with the very marked sex difference found in children (Else-Quest et al., 2006). Effortful control in children is measured with the Child Behaviour Questionnaire (Rothbart, Ahadi, Hershey, & Fisher, 2001) by summing five scales that appear to assess cool executive functions and avoidance of high sensory stimulation. In the former domain, effect sizes were small for the measures of attention focus (d = –0.16) and attention shifting (d = –0.31). Effect sizes reflecting tolerance for low levels of sensation were somewhat higher; perceptual sensitivity (detection of slight, low intensity stimuli, d = –0.38), low-intensity pleasure (enjoyment of situations involving low stimulus intensity, d = –0.29), and inhibitory control (capacity to suppress approach responses in uncertain situations or when instructed, d = –0.41). These latter measures appear to capture aspects of (reversed) sensation hunger. It may be that the aggregated effortful control value (d = -1.01) disproportionately reflects these sex differences in sensation seeking and, if this is the case, is somewhat more consistent with our findings for adults. As noted previously, the Child Behaviour Questionnaire assesses impulsiveness separately from effortful control as speed of response initiation (a facet of Surgency/Extraversion). Here, the effect size of d =0.18 is only slightly larger than our adult values for several Impulsivity measures. Alternatively, differences in data sources may explain the apparent convergence of the sexes with age. In Else-Quest et al.'s (2006) meta-analysis, the vast majority of the data came from parents' or teachers' ratings of child behaviour. The larger sex difference they report might reflect gender stereotyping effects associated with third-party reports, a possibility considered by the authors.

To the extent that sex differences in impulsivity do indeed narrow with age, differential neuronal maturation may be a candidate explanation. Both sexes acquire stronger inhibitory control as they move toward adulthood, which may be tied to the late maturation of prefrontal areas – especially the dorsolateral and ventromedial regions (Hooper, Luviana, Conklin & Yarger, 2004). Girls show an earlier maturation peak in frontal lobe areas but, during adolescence, boys show a sharper increase in grey matter reduction and white matter development (Giedd et al., 2006). There is also evidence that boys and girls may recruit different neuronal circuits to solve the same inhibitory control problem (Christakou et al., 2009): This possibility could be usefully investigated in future work.

Variance ratios

Archer & Mehdikhani (2003) proposed that traits reflecting sexually selected characteristics should show significantly greater variance among males than among females. This proposal stems from the fact that men have more freedom to vary in their sexual strategy in terms of offering high or low levels of paternal investment. Greater male variance, therefore, stems from the retention of both male strategies in the gene pool. Women, as a sex, are more constrained in the levels of maternal investment they must make, which results in lower intrasexual variance. Greater male than female variance has been found on a number of physical (Lehre et al.,

2009) and psychological (Archer & Mehdikhani, 2003; Hedges & Nowell, 1995) measures. Operationally, sexual selection is inferred when the sexes vary in central tendency. Sensation seeking and punishment sensitivity are therefore candidates for examining Archer and Mehdikhani's thesis. Variance ratios did not differ significantly from 1 in these or in other impulsivity measures, except on the SSS Disinhibition scale. This null result is surprising given that sex differences in risk taking are thought to arise from differential parental investment (Daly & Wilson, 1988). Furthermore, differences in central tendency strongly suggest the action of sexual selection. The exclusion criteria of the current analysis might account for this null finding. For reasons outlined in the preceding sections, we excluded clinical and incarcerated samples, which places a constraint on the observed variability. Given the overrepresentation of men and boys in pathological and criminal behaviour in which risk taking is a factor, it is not unreasonable to suggest that this constraint may affect the male variance more than the female variance, leading to a non-significant sex difference here. Our observation of equal variance is therefore inconclusive, rather than contradictory to Archer and Mehdikhani's thesis.

Summary and Suggestions

Our results suggest that sex differences are most evident in low-level motivational responses captured by punishment and reward sensitivity, risk taking, and sensation seeking. Where human behavioural sex differences mirror those found in other species, the most likely neural sites are lower-level limbic system processes that are phylogenetically conserved. Greater risk taking by males is characteristic of a number of mammalian species (Daly & Wilson, 1983). For example, male common chimpanzees are more reckless, impulsive, and active than females (King, Weiss & Sisco, 2008). The present results suggest that it may be women's greater sensitivity to and anxiety about the punishing consequences of risky action that deters them from the same level of engagement as men.

Sex differences are much smaller for effortful control, which suggests that it has been less subject to sexual selection. The ability to control the expression of emotions is key to sustaining the stable social groups on which both sexes depend (Barklay, 2001; MacDonald, 2008). The enlargement of the human neocortex has been attributed to the need for fast and flexible behavioural adjustment to unpredictable changes within the lifetime of the individual (Plotkin, 1997). Such demands have been as great for men as for women and, where selection acts equally on both sexes, sex differences are not expected. The marked over-representation of men in aggressive and sexual social pathologies may tell us more about the strength of sexual selection acting on male sexuality and aggression than the natural selection pressures operating on impulse restraint.

We end with three lessons that we have learned from undertaking this analysis which we hope will be helpful in guiding future research.

Impulsivity is not unitary. In our introduction, we highlighted the distinctly non-unitary nature of impulsivity as a construct. Attempts to integrate various psychometric and behavioural measures into a coherent and replicable set of dimensions have not been entirely successful. This state of affairs may be due to a heavy reliance on factor analysis: The pools of measures entered into the analyses vary between studies, so different results are produced. Elucidating the dimensionality of impulsivity requires convergent evidence. One promising route might be through imaging studies where the neural structures and circuits associated with different forms of impulsivity may indicate their distinctiveness (e.g. Dalley, Mar, Economidou & Robbins, 2008; Davidson, Jackson, & Kalin, 2000; Llewellyn, 2008; Meyer-Lindenberg et al., 2006; Smillie, 2008). Until such clarity is achieved, we can only urge caution. Our analysis shows that sex differences depend very much on the inventory or task that is employed. Generalisations from a specific measure to impulsivity more generally must be made tentatively and must acknowledge the multifaceted nature of the construct.

Impulsivity may be both hot and cool. An important distinction within impulsivity is between different forms of higher-order control. Executive function is primarily concerned with cognitive aspects of impulsivity manifested in failures of attention maintenance and switching, and the establishment and reorganisation of dimensional sets. These might rely on different neural structures (dorsolateral prefrontal cortex) than those recruited in effortful control over emotional and affective states (orbitofrontal prefrontal cortex). We find no sex differences in the former and evidence of small differences in the latter. These conclusions must remain tentative until we have a clearer understanding of the extent to which various tasks and measures uniquely assess one system rather than the other. Behavioural tasks vary greatly in which system they engage, and it is often unclear whether a given task is being processed affectively or cognitively. For example, there has been a tendency to assume that the use of monetary incentives is sufficient to render a task affective. It would be helpful to have this contention confirmed by neuroimaging studies, especially in regard to possible sex differences. The corresponding ambiguity in psychometric inventories arises from the use of non-specific item wording: "'I often act without thinking" can be interpreted to apply to cool executive disinhibition (e.g., careless mistakes in solving a mathematical problem) or to an override of affective effortful control (e.g., insulting your boss).

Impulsivity is not sensation seeking. There is a clear conceptual and empirical distinction between sensation seeking and impulsivity. Although there is little unanimity regarding the definition of impulsivity, it has been variously described as acting without deliberation, failure to inhibit a prepotent response, lack of planning, and failure of perseverance. None of these characteristics applies to sensation-seeking activities. We suggest that sensation seeking should be recognised as a dimension of personality distinct from impulsivity, rather than a trait subsumed by it. Our results provide support for this contention: They clearly indicate that sex differences are small for impulsivity but considerably more marked for sensation seeking. Using the two constructs interchangeably may produce misleading results with regard to sex differences.

Many impulsive actions are harmless. Hugging someone out of happiness, buying a treat on the spur of the moment, or opting for a new dish at a restaurant are hardly dangerous actions, for the most part. Parachuting, rock-climbing, or skiing, although risky, are not generally impulsive. They require planning, training, and a measured consideration of the risk. Yet some actions may clearly be both impulsive and risky: running across a road, having sex with a stranger, or accepting an offer of drink or drugs, for example (Campbell & Muncer, 2009). The assessment of actions that are both risky and impulsive is an area in need of attention. We believe that this form of impulsive risk taking – risky impulsivity – is most likely to underlie aggressive and criminal behaviour.

Acknowledgement: We would like to thank Steven Muncer for statistical advice. Thanks also to all the authors who kindly provided data for inclusion in the analysis and to Joanne Campbell, Natalie Gray, and Trixie Lo for assistance with coding and proofreading. We are grateful to Roy Baumeister, Philip Corr, and Marvin Zuckerman for responding to theoretical and conceptual queries.

Summary

The present paper indicates that psychometric measures of trait impulsivity are not well suited to investigating sex differences in risky behaviour, because they tend to show very weak sex differences. Measures of sensation seeking show more robust sex differences but, as noted, they do not measure risk taking on impulse: Many of the activities to which they refer, although risky, require careful planning. While the sex difference in the willingness to engage in risky activities such as mountain-climbing or parachuting might well reflect important differences in the psychology of men and women, it does not tell us whether there are sex differences in the willingness to take risks on impulse.

The risky impulsivity measure was developed specifically to combine the lack of forethought characteristic of impulsivity measures with the element of risk which features in sensation seeking measures (Campbell & Muncer, 2009). The present meta-analysis included three studies which measured risky impulsivity and the average sex difference was d = 0.33. Furthermore, Campbell and Muncer’s original paper reports an effect size of d = 0.41. This suggests that risky impulsivity has a sensitivity to sex differences which typical trait measures of impulsivity lack. The paper in the following chapter therefore uses risky impulsivity to investigate sex differences in same-sex aggression and sociosexuality.

References

References marked with an asterisk indicate studies included in the meta-analysis that are discussed in the text. For a complete list, see Appendix B

Aluja, A., & Torrubia, R. (2004). Hostility-aggressiveness, sensation seeking and sex hormones in men: Re-exploring their relationship. N*europsychobiology, 50,* 102-107. doi:10.1159/000077947

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed- TR). Washington, DC: Task Force. doi:10.1176/appi.books.9780890423349

Archer, J. (2004). Sex differences in aggression in real-world settings: A meta-analytic review. *Review of General Psychology, 8,* 291-322. doi:10.1037/1089-2680.8.4.291

Archer, J. (2006). Testosterone and human aggression: An evaluation of the challenge hypothesis. *Neuroscience and Biobehavioral Reviews, 30, 319-335*.

Archer, J. (2009). Does sexual selection explain human sex differences in aggression? *Behavioral and Brain Sciences, 32,* 249-311. doi:10.1017/s0140525x09990951

Archer, J., & Mehdikhani, M. (2003). Variability among males in sexually selected attributes. *Review of General Psychology, 7,* 219-236. doi:10.1037/1089-2680.7.3.219

Ardila, A. (2008). On the evolutionary origins of executive functions. *Brain and Cognition, 68,* 92-99. doi:10.1016/j.bandc.2008.03.003

Arneklev, B. J., Grasmick, H. G., Tittle, C. R., & Bursik, R. J. (1993). Low self-control and imprudent behavior. *Journal of Quantitative Criminology, 9,* 225–247. doi:10.1007/BF01064461

Arnett, J. (1994). Sensation seeking: A new conceptualization and a new scale. *Personality and Individual Differences, 16*(2), 289-296. doi:10.1016/0191-8869(94)90165-1.

Ball, S.A., & Zuckerman, M. (1990). Sensation seeking, Eysenck's personality dimensions and reinforcement sensitivity theory in concept formation. *Personality and Individual Differences, 11,* 343-353.

Band, G.P.H., & van Boxtel, G.J.M. (1999). Inhibitory motor control in stop paradigms: review and reinterpretation of neural mechanisms. *Acta Psychologica, 101,* 179-211. doi:10.1016/S0001-6918(99)00005-0

Bar-Haim, Y., Lamy, D., Pergamin, L., Bakermans-Kranenburg,M. J., & van IJzendoorn,M. H. (2007). Threat-related attentional bias in anxious and nonanxious individuals: A meta-analytic study. *Psychological Bulletin, 133,* 1−24. doi**:** 10.1037/0033-2909.133.1.1

Barkley, R.A. (2001). The executive functions and self-regulation: An evolutionary neuropsychological perspective. *Neuropsychology Review, 11*, 1-29.

Barlow, D. H. (2002). *Anxiety and its disorders: The nature and treatment of anxiety and panic.* New York: Guilford. doi:10.1016/S1077-7229(03)80027-5

Barratt, E. S. (1985). Impulsiveness subtraits: Arousal and information processing. In J.T. Spence and C.E. Izard (Eds). *Motivation, emotion and personality (pp. 137–146).* Amsterdam: Elsevier Science Publishers.

Baumeister, R.F., Vohs, K.D., & Tice, D.M. (2007). The strength model of self-control. *Current Directions in Psychological Science, 16,* 351-355. doi:10.1111/j.1467-8721.2007.00534.x

Beattie, G. (2008). Sex differences in driving and insurance risk: Understanding the neurobiological and evolutionary foundations of the differences. Manchester: University of Manchester

Bechara, A., Damasio, A. R., Damasio, H., & Anderson, S. W. (1994). Insensitivity to future consequences following damage to human prefrontal cortex. *Cognition, 50, 7-15.*

Bechara, A., Damasio, H., Tranel, D., & Damasio, A.R. (1997). Deciding advantageously before knowing the advantageous strategy. *Science, 275,* 1293-1295. doi:10.1126/science.275.5304.1293

Begg, C. B., & Mazumdar, M. (1994). Operating characteristics of a rank correlation test for publication bias. *Biometrics, 50*, 1088-1101. doi:10.2307/2533446

Bettencourt, B. A., & Miller, N. (1996). Gender differences in aggression as a function of provocation: A meta-analysis. *Psychological Bulletin, 119*, 422-447. doi:10.1037/0033-2909.119.3.422

Bijttebier, P., Beck, I., Claes, L., & Vandereycken, W. (2009). Gray's Reinforcement Sensitivity Theory as a framework for research on personality-psychopathology associations. *Clinical Psychology Review, 29,* 421-430. doi:10.1016/j.cpr.2009.04.002

Bjorklund, D.F., & Kipp, K. (1996). Parental investment theory and gender differences in the evolution of inhibition mechanisms. *Psychological Bulletin, 120*, 163-188. doi: 10.1037/0033-2909.120.2.163

Blackwell, B.S. & Piquero, A.R. (2005). On the relationships between gender, power control, self-control and crime. *Journal of Criminal Justice, 33,* 1-17. doi:10.1016/j.jcrimjus.2004.10.001

Block, J., Block, J. H., & Harrington, D. M. (1974). Some misgivings about the Matching Familiar Figures test as a measure of reflection-impulsivity. *Developmental Psychology*,*10,* 611-632. doi.org/10.1037/h0037047

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). *Introduction to Meta-Analysis*. John Wiley & Sons, Ltd. doi:10.1002/9780470743386

Brebner, J. (2003). Gender and emotions. *Personality and Individual Differences, 34*, 387-394. doi:10.1016/S0191-8869(02)00059-4

Burton, V. S., Cullen, F. T., Evans, T. D., Alarid, L. F., & Dunaway, R. G. (1998). Gender, self-control, and crime. *Journal of Research in Crime and Delinquency, 35*, 123– 147. doi:10.1177/0022427898035002001

Byrnes, J.P., Miller, D.C., & Schafer, W.D. (1999). Gender differences in risk taking: A meta-analysis. *Psychological Bulletin, 125,* 367-383. doi:10.1037/0033-2909.125.3.367

Cale, E., & Lilienfeld, S.O. (2002). Sex differences in psychopathy and antisocial personality disorder: A review and integration. *Clinical Psychology Review, 22*, 1179–1207. doi:10.1016/S0272-7358(01)00125-8

Campbell, A. (1999). Staying alive: Evolution, culture and intra-female aggression. *Behavioral and Brain Sciences, 22,* 203-252. doi:10.1017/S0140525X99001818

Campbell, A. (2002). *A mind of her own: The evolutionary psychology of women.* Oxford: Oxford University Press.

Campbell, A. (2006). Sex differences in direct aggression: What are the psychological mediators? *Aggression and Violent Behavior, 11,* 237-264. doi:10.1016/j.avb.2005.09.002

Campbell, A., & Muncer, S. (2009). Can ‘risky’ impulsivity explain sex differences in aggression? *Personality and Individual Differences, 47,* 402-406. doi:10.1016/j.paid.2009.04.006

Carver, C.S. (2005). Impulse and constraint: Perspectives from personality psychology, convergence with theory in other areas and potential for integration. *Personality and Social Psychology Review, 9*, 312-333. doi:10.1207/s15327957pspr0904_2

Carver, C.S., & White, T.L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS Scales. *Journal of Personality and Social Psychology, 67,* 319-333. doi:10.1037/0022-3514.67.2.319

Casey, B.J., Getz, S. & Galvan, A. (2008). The adolescent brain. *Developmental Review, 28*, 62-77. doi:10.1016/j.dr.2007.08.003

Center for Wellbeing (n.d.) *TCI: A comprehensive assessment of personality.* St. Louis, MQ; Washington University School of Medicine. Retrieved from http://psychobiology.wustl.edu/7dimensions.html

Christakou, A., Halari, R., Smith, A. B., Ifkovits, E., Brammer, M., & Rubia, K. (2009). Sex-dependent age modulation of frontostriatal and temporo-parietal activation during cognitive control. *Neuroimage, 48*, 223-236. doi:10.1016/j.neuroimage.2009.06.070

Cloninger, C.R. (1986). A unified biosocial theory of personality and its role in the development of anxiety states. *Psychiatric Developments, 4,* 167-226.

Cloninger, C.R. (1987). A systematic method for clinical description and classification of personality variants. A proposal. *Archives of General Psychiatry, 44,* 573 - 88.

Coccaro, E.F., Beresford, B., Minar, P., Kaskow, J., & Geracioti, T. (2007). CSF testosterone: Relationship to aggression, impulsivity, and venturesomeness in adult males with personality disorder. *Journal of Psychiatric Research, 41,* 488-492. doi:10.1016/j.jpsychires.2006.04.009

Colom, R., Contreras, J., Shih, P. C., & Santacreu, J. (2003). The assessment of spatial ability with a single computerized test. *European Journal of Psychological Assessment, 19*(2), 92-100. 10.1027//1015-5759.19.2.92.

Conners, C.K. (2000). *Conner's continuous performance test (CPT II).* North Tonawanda, NY: Multi-Health Systems.

Costa, P.T., & McCrae, R.R. (1992). Revised NEO Personality Inventory (NEO PI-R) and NEO Five Factor Inventory (NEO-FFI): Professional manual. Odessa, FL: Psychological Assessment Resources.

Costa, P. T., Jr., Terracciano, A., & McCrae, R. R. (2001). Gender differences in personality traits across cultures: Robust and surprising findings. *Journal of Personality and Social Psychology, 81,* 322–331. doi:10.1037/0022-3514.81.2.322

Crean, J.P., de Wit, H. & Richards, J.B. (2000). Reward discounting as a measure of impulsive behavior in a psychiatric outpatient population. *Experimental and Clinical Psychopharmacology, 8,* 155-162. doi:10.1037/1064-1297.8.2.155

Cross, S. E., & Madson, L. (1997). Models of the self: Self-construals and gender. *Psychological Bulletin*, *122*, 5-37. doi:10.1037/0033-2909.122.1.5

Cummings, J.L. (1993). Frontal-subcortical circuits and human behaviour. *Archives of Neurology, 50,* 873-880.

Daitzman, R .J. & Zuckerman, M. (1980) Disinhibitory sensation seeking, personality, and gonadal hormones. *Personality and Individual Differences 1,* 103-110. doi:10.1016/0191-8869(80)90027-6

Dalley, J.W., Mar, A.C., Economidou, D. & Robbins, T.W. (2008). Neurobehavioral mechanisms of impulsivity: Fronto-striatal systems and functional neurochemistry. *Pharmacology, Biochemistry and Behavior, 90,* 250-260. doi:10.1016/j.pbb.2007.12.021

Daly M., & Wilson, M. (1983). *Sex, evolution and behavior: Adaptations for reproduction.* Boston, MA: Willard Grant Press.

Daly M., & Wilson, M. (1988) *Homicide.* New York: Aldine de Gruyter.

Davidson, R.J., Jackson, D.C., & Kalin, N.H. (2000). Emotion, plasticity, context, and regulation: Perspectives from affective neuroscience. *Psychological Bulletin, 126*, 890-909. doi:10.1037/0033-2909.126.6.890

Davidson, R.J., Putnam, K.M., & Larson, C.L. (2000). Dysfunction in the neural circuitry of emotion regulation: A possible prelude to violence. *Science, 289*, 591-594. doi:10.1126/science.289.5479.591

Dawe, S., Gullo, M. J., & Loxton, N. J. (2004). Reward drive and rash impulsiveness as dimensions of impulsivity: Implications for substance misuse. *Addictive Behaviors, 29,* 1389–1405. doi:10.1016/j.addbeh.2004.06.004

Degenhardt, L., Chiu, W.T., Sampson, N., Kessler, R.C., Anthony, J.C., Angermeyer, M., et al. (2008) Toward a global view of alcohol, tobacco, cannabis, and cocaine use: Findings from the WHO World Mental Health Surveys. *PLoS Medicine, 5,*1053-1067. e141. doi:10.1371/journal.

Depue, R. A., & Collins, P. F. (1999). Neurobiology of the structure of personality: Dopamine, facilitation of incentive motivation, and extraversion. Behavioral and Brain Sciences, 22(3), 491-+. doi:10.1017/S0140525X99002046.

Derryberry, D., & Rothbart, M.K. (1997). Reactive and effortful processes in the organization of temperament. *Development and Psychopathology, 9,* 633-652. doi:10.1017/S0954579497001375

Deschenes, E.P., & Esbensen, F.A. (1999). Violence and gangs: Gender differences in perception and behavior. *Journal of Quantitative Criminology, 15,* 63-96.

Dickman, S.J. (1990). Functional and dysfunctional impulsivity: Personality and cognitive correlates. *Journal of Personality and Social Psychology, 58*, 95-102. doi:10.1037/0022-3514.58.1.95

Dickman, S., & Meyer, D. E. (1988). Impulsivity and speed-accuracy tradeoffs in information processing. *Journal of Personality and Social Psychology, 54,* 274-290. doi:10.1037/0022-3514.54.2.274

Dougherty, D.M., Mathias, C.W., Marsh-Richard, D.M., Furr, R.M., Nouvion, S.O., & Dawes, M.A. (2009). Distinctions in behavioral impulsivity: Implications for substance abuse research. *Addictive Disorders and their Treatment, 8,* 61-73. doi:10.1097/ADT.0b013e318172e488

D'Zurilla, T., Nezu, A. & Maydeu-Olivares, A. (1996). *Manual for the social problem-solving inventory–Revised*. North Tonawanda, NY: Multi-Health Systems.

Eagly, A.H., & Steffen, V. (1986). Gender and aggressive behaviour: A meta-analytic review of the social psychological literature. *Psychological Bulletin, 100*, 3-22. doi:10.1037/0033-2909.100.3.309

Else-Quest, N.M., Hyde, J.S., Goldsmith, H.H., & Van Hulle, C.A. (2006). Gender differences in temperament: A meta analysis. *Psychological Bulletin, 132,* 33-72. doi:10.1037/0033-2909.132.1.33

*Enticott, P.G., Ogloff, J.R.P., & Bradshaw, J.L. (2006). Associations between laboratory measures of executive inhibitory control and self-reported impulsivity. *Personality and Individual Differences, 41,* 285-294. doi:10.1016/j.paid.2006.01.011

Evenden, J.L. (1999). Varieties of impulsivity. *Psychopharmacology, 146,* 348-361. doi:10.1007/PL00005481

Eysenck, H.J., & Eysenck, M.W. (1985). Personality and individual differences: A natural science approach. New York: Plenum Press.

Eysenck, H.J., & Eysenck, S.B.G. (1968). *Manual for the Eysenck Personality Inventory*. San Diego: Educational and Industrial Testing Service.

Eysenck, H.J., & Gudjonsson, G.H. (1989). *The causes and cures of criminality.* New York: Plenum.

Eysenck, S.G.B. (1993). The I_7: Development of a measure of impulsivity and its relationship to the superfactors of personality. In W.G. McCown, J.L. Johnson & M.B. Shure (eds) *The impulsive client: Theory, research and treatment.* (pp. 141-149). American Psychological Association, Washington, D.C.

Eysenck, S. B. G., & Eysenck, H. J. (1978). Impulsiveness and venturesomeness: Their position in a dimensional system of personality description. *Psychological Reports, 43*(3), 1247-1255.

*Eysenck, S.B.G., Pearson, P.R., Easting, G., & Allsopp, J.F. (1985). Age norms for impulsiveness, venturesomeness and empathy in adults. *Personality and Individual Differences, 6, 613-619.* doi:10.1016/0191-8869(85)90011-X

Farrington, D. P., Loeber, R., & van Kammen, W. B. (1990). Long-term criminal outcomes of hyperactivity–impulsivity–attention deficit and conduct problems in childhood. In L. N. Robins, & M. Rutter (Eds.), *Straight and devious pathways from childhood to adulthood* (pp. 62–81). Cambridge, England: Cambridge University Press.

Feingold, A. (1994). Gender differences in personality: A meta-analysis. *Psychological Bulletin, 116,* 429–456. doi:10.1037/0033-2909.116.3.429

Fischer, A.H., & Manstead, A.S.R. (2000). Gender and emotions in different cultures. In A.H. Fischer (Ed.) *Gender and emotion: Social psychological perspectives* (pp. 71-94). Cambridge: Cambridge University Press. doi:10.1017/CBO9780511628191

Fowles, D.C. (1987). Application of a behavioural theory of motivation to the concepts of anxiety and impulsivity. *Journal of Research in Personality, 21,* 417-436. doi:10.1016/0092-6566(87)90030-4

Fowles, D.C. (1988). Psychophysiology and psychopathology: A motivational approach. *Psychophysiology, 25,* 373-391. doi:10.1111/j.1469-8986.1988.tb01873.x

Frank, E. (Ed.) (2000). *Gender and its effects on psychopathology.* Arlington, VA: American Psychiatric Press.

Franken, I.H.A., & Muris, P. (2006). Gray's impulsivity dimension: A distinction between reward sensitivity versus rash impulsiveness. *Personality and Individual Differences, 40,* 1337-1347. doi:10.1016/j.paid.2005.11.016

Fuster, J.M. (1997). The prefrontal cortex: Anatomy, physiology and neuropsychology. Philadelphia: Lippincott-Raven.

Gallardo-Pujol, D., Krarnp, U., Garcia-Forero, C., Perez-Ramirez, M., & Andres-Pueyo, A. (2006). Assessing aggressiveness quickly and efficiently: the Spanish adaptation of Aggression Questionnaire-Refined version. European Psychiatry, 21(7), 487-494.

Garcia-Forero, C., Gallardo-Pujol, D., Maydeu-Olivares, A., & Andres-Pueyo, A. (2009). Disentangling impulsiveness, aggressiveness and impulsive aggression: an empirical approach using self-report measures. Psychiatry Res, 168(1), 40-49. doi:10.1016/j.psychres.2008.04.002.

Gerbing, D.W., Ahadi, S.A., & Patton, J.H. (1987). Toward a conceptualization of impulsivity: Components across the behavioural and self-report domains. *Multivariate Behavioral Research, 22,* 357-379. doi:10.1207/s15327906mbr2203_6

Gershon, J., & Gershon, J. (2002). A meta-analytic review of gender differences in ADHD. *Journal of Attention Disorders, 5,* 143-154. doi:10.1177/108705470200500302

Giedd, J. N., Clasen, L. S., Lenroot, R., Greenstein, D., Wallace, G. L., Ordaz, S., et al. (2006). Puberty-related influences on brain development. *Molecular and Cellular Endocrinology, 254*, 154-162. doi:10.1016/j.mce.2006.04.016

Goldstein, J.M., Seidman, L.J., Horton, N.J., Markris, N., Kennedy, D.N., Caviness, V.S., et al. (2001). Normal sexual dimorphism of the adult human brain assessed in vivo magnetic resonance imaging. *Cerebral Cortex, 11,* 490-497. doi:10.1093/cercor/11.6.490

Gomez, R. & Gomez, A. (2005). Convergent, discriminant and concurrent validities of measures of the behavioural approach and behavioural inhibition systems: Confirmatory factor analytic approach. *Personality and Individual Differences, 38,* 87–102. doi:10.1016/j.paid.2004.03.011

Gottfredson, M., & Hirschi, T. (1990). *A general theory of crime.* Stanford, CA: Stanford University Press.

*Goudriaan, A.E., Grekin, E.R., & Sher, J. (2007). Decision making and binge drinking: A longitudinal study. *Alcoholism: Clinical and Experimental Research, 31,* 928-938. doi:10.1111/j.1530-0277.2007.00378.x

Grasmick, H.G., Tittle, C.R., Bursik, R.J., & Arneklev, B.J. (1993). Testing the core empirical implications of Gottfredson and Hirschi's general theory of crime. *Journal of Research in Crime and Delinquency, 30,* 5-29. doi:10.1177/0022427893030001002

Gray, J. A. (1970). The psychophysiological basis of introversion-extraversion. *Behaviour Research and Therapy, 8,* 249−266. doi:10.1016/0005-7967(70)90069-0

Gray, J.A. (1982). *The neuropsychology of anxiety.* Oxford: Oxford University Press.

Gray, J. A., & McNaughton, N. (2000). The neuropsychology of anxiety: An enquiry into the functions of the septo-hippocampal system. Oxford: Oxford University Press.

Gur, R. C., Gunning-Dixon, F., Bilker, W. B., & Gur, R. E. (2002). Sex differences in temporo-limbic and frontal brain volumes of healthy adults. Cerebral Cortex, 12(9), 998-1003. doi:10.1093/cercor/12.9.998.

Hall, J. A. (1984). Nonverbal sex differences: Communication accuracy and expressive style. Baltimore: Johns Hopkins University Press.

Happanay, K., Zelazo, P.D., & Stuss, D.T. (2004). Development of orbitofrontal function: Current themes and future directions. *Brain and Cognition, 55,* 1-10. doi:10.1016/j.bandc.2004.01.001

Hardy, R. J., & Thompson, S. G. (1998). Detecting and describing heterogeneity in meta-analysis. *Statistics in Medicine, 17*, 841-856. doi:10.1002/(SICI)1097-0258(19980430)17:8<841::AID-SIM781>3.0.CO;2-D

Harris, C. R., Jenkins, M., & Glaser, D. (2006). Gender differences in risk assessment: Why do women take fewer risks than men? *Judgment and Decision Making Journal, 1,* 48-63

Hedges, L. V., & Nowell, A. (1995). Sex differences in mental test scores, variability, and numbers of high scoring individuals. *Science, 269,* 41–45. doi:10.1126/science.7604277

Hedges, L. V., & Olkin, I. (1985). *Statistical methods for meta-analysis.* London: Academic Press.

Hedges, L. V., & Pigott, T. D. (2004). The power of statistical tests for moderators in meta-analysis. *Psychological Methods, 9,* 426-445. doi:10.1037/1082-989X.9.4.426

Helmers, K.F., Young, S.N. & Pihl, R.O. (1995). Assessment of measures of impulsivity in healthy male volunteers. *Personality and Individual Differences, 19,* 927-935. doi:10.1016/S0191-8869(95)00107-7

Heym, N., Ferguson, E., & Lawrence, C. (2008). An evaluation of the relationship between Gray's revised RST and Eysenck's PEN: Distinguishing BIS and FFFS in Carver and White's BIS/BAS scales. *Personality and Individual Differences, 45,* 709−715. doi:10.1016/j.paid.2008.07.013

Higgins, J. P. T. (2008). Heterogeneity in meta-analysis should be expected and appropriately quantified. *International Journal of Epidemiology, 37*, 1158-1160. doi:1158-1160.10.1093/ije/dyn204

Higgins, J. P. T., & Thompson, S. G. (2002). Quantifying heterogeneity in a meta-analysis. *Statistics in Medicine, 21,* 1539-1558. doi:10.1002/sim.1186

Hooper, C.J., Luviana, M., Conklin, H.M., & Yarger, R.S. (2004). Adolescents' performance on the Iowa Gambling Task: Implications for the development of decision making and ventromedial prefrontal cortex. *Developmental Psychology, 40,* 1148–1158. doi:10.1037/0012-1649.40.6.1148

Horgan, T.G., Mast, M.S., Hall, J.A., & Carter, J.D. (2004). Gender differences in memory for the appearance of others. *Personality and Social Psychology Bulletin, 30,* 185-196. doi:10.1177/0146167203259928

Hsu, C., Soong, W., Stigler, J.W., Hong, C. & Liang, C. (1981). The temperamental characteristics of Chinese babies. *Child Development, 52,* 1337-1340. doi:10.2307/1129528

Hyde, J.S. (1986). Gender differences in aggression. In J.S. Hyde & M.C.Linn (Eds.) *The psychology of gender: Advances through meta-analysis* (pp. 51-66). Baltimore, MD: Johns Hopkins University Press.

Jackson, D. N. (1994). *Jackson Personality Inventory—Revised manual*. Research Psychologists Press, Port Huron, MI.

Jensen, A. R. (1998). *The g Factor: The Science of Mental Ability.* Westport, CT: Praeger Publishers.

Kagan, J., Rosman, B. L., Day, D., Albert, J., & Phillips, W. (1964). Information-processing in the child: Significance of analytic and reflective attitudes. *Psychological Monographs, 78,* 1-37.

Keane, C., Maxim, P., & Teevan, J. (1993). Drinking and driving, self-control, and gender. *Journal of Research in Crime and Delinquency, 30,* 30– 46. doi:10.1177/0022427893030001003

Kessler, R.C., Coccaro, E.F., Fava, M., Jaeger, S., Jin, R., & Walters, E. (2006). The prevalence and correlates of DSM-IV intermittent explosive disorder in the National Comorbidity Survey Replication. *Archives of General Psychiatry, 63,* 669-678. doi:10.1001/archpsyc.63.6.669

Kindlon, D., Mezzacappa, E., & Earls, F. (1995). Psychometric properties of impulsivity measures: Temporal stability, validity and factor structure. *Journal of Child Psychology and Psychiatry and Allied Discipline, 36,* 645-661. doi:10.1111/j.1469-7610.1995.tb01316.x

King, J.E., Weiss, A., & Sisco,M.M. (2008). Aping humans: Age and sex effects in chimpanzees (Pan troglodytes) and human (Homo sapiens) personality. *Journal of Comparative Psychology, 122,* 418-427. doi: 10.1037/a0013125

Kirby, K.N., Petry, N.M., & Bickel, W.K. (1999). Heroin addicts have higher discount rates for delayed rewards than non-drug-using controls. *Journal of Experimental Psychology General, 128*, 78-87. doi:10.1037/0096-3445.128.1.78

Knight, G.P., Fabes, R.A., & Higgins, D.A. (1996). Concerns about drawing causal inferences from meta-analyses: An example in the study of gender differences in aggression. *Psychological Bulletin, 119*, 410-421. doi:10.1037/0033-2909.119.3.410

Knight, G.P., Guthrie, I.K., Page, M.C., & Fabes, R.A. (2002). Emotional arousal and gender differences in aggression: A meta-analysis. *Aggressive Behavior, 28*, 366-393. doi:10.1002/ab.80011

Kochanska, G., & Knaack, A. (2003). Effortful control as a personality characteristic of young children: Antecedents, correlates, and consequences. *Journal of Personality, 71,* 1087-1112. doi:10.1111/1467-6494.7106008

Kruger, D. J., & Nesse, R. M. (2006). An evolutionary life-history framework for understanding sex differences in human mortality rates. *Human Nature, 17,* 74-97. doi:10.1007/s12110-006-1021-z

LaGrange, T. C., & Silverman, R. A. (1999). Low self-control and opportunity: Testing the general theory of crime as an explanation for gender differences in delinquency. *Criminology, 37,* 41– 72. doi:10.1111/j.1745-9125.1999.tb00479.x

Lane, S.D., Cherek, D.R., Rhodes, H.M., Pietras, C.J., & Tcheremissine, O.V. (2003). Relationships among laboratory and psychometric measures of impulsivity: Implications in substance abuse and dependence. *Addictive Disorders and Their Treatment, 2,* 33-40. doi:10.1097/00132576-200302020-00001

Larsen, C.S. (2003). Equality for the sexes in human evolution? Early hominid sexual dimorphism and implications for mating systems and social behaviour. *Proceedings of the National Academy of Sciences of the United States of America, 100,* 9103-9104. doi:10.1073/pnas.1633678100

Lehre, A.C., Lehre, K.P., Laake, P., & Danbolt, N.C. (2009). Greater intrasex phenotype variability in males than in females is a fundamental aspect of gender differences in humans. *Developmental Psychobiology, 51,* 198-206. doi:10.1002/dev.20358

Lerner, J. S., & Keltner, D. (2000). Beyond valence: Toward a model of emotion-specific influences on judgement and choice. *Cognition & Emotion, 14*(4), 473-493. doi:10.1080/026999300402763

Lipsey, M.W., & Wilson, D.B. (2001). *Practical Meta Analysis*. London: Sage Publications Ltd.

Llewellyn, D.J. (2008). The psychology of risk taking: Toward the integration of psychometric and neuropsychological paradigms. *American Journal of Psychology, 121,* 363-376.

Loewenstein, G.F., Weber, E.U., Hsee, C.K., & Welch, N. (2001). Risk as feelings. *Psychological Bulletin, 127*, 267-286. doi:10.1037/0033-2909.127.2.267

Logan, G. D., Schachar, R. J., & Tannock, R. (1997). Impulsivity and inhibitory control. *Psychological Science, 8, 60-64*

Longshore, D., Turner, S., & Stein, J. A. (1996). Self-control in a criminal sample: An examination of validity. *Criminology, 34,* 209– 228. doi:10.1111/j.1745-9125.1996.tb01203.x

Lykken, D.T. (1957). A study of anxiety in the sociopathic personality. *Journal of Abnormal and Social Psychology, 55,* 6-10. doi: 10.1037/h0047232

Lykken, D. T. (1995). *The antisocial personalities.* Mahwah, NJ: Erlbaum.

Lynam, D. R., & Miller, J. D. (2004). Personality pathways to impulsive behavior and their relations to deviance: Results from three samples. Journal of Quantitative Criminology, 20(4), 319-341. doi:10.1007/s10940-004-5867-0.

MacDonald, K. (2008). Effortful control, explicit processing, and the regulation of human evolved predispositions. *Psychological Review, 115,* 1012-1031. doi:10.1037/a0013327

Macleod, C. M. (1991). Half a century of research on the Stroop effect: An integrative review. *Psychological Bulletin, 109, 163-203.*

Madden, G.J., Begotka, A.M., Raiff, B.R., & Kastern, L.L. (2003). Delay discounting of real and hypothetical rewards. *Experimental and Clinical Psychopharmacology, 11,* 139–145. doi:10.1037/1064-1297.11.2.139

Maziade, M., Boudreault, M., Thiverge, J., Caperaa, P., & Cote, R. (1984). Infant temperament: SES and gender differences and reliability of measurement in a large Quebec sample. *Merrill-Palmer Quarterly Journal of Developmental Psychology, 30,* 213-226.

Mazur, J.E. (1987). An adjusting procedure for studying delayed reinforcement. In: M.L. Commons, J.E. Mazur, J.A. Nevin, & H. Rachlin (Eds) *Quantitative analysis of behavior: Vol 5. The effect of delay and intervening events on reinforcement value* (pp 55–73). Hillsdale, NJ: Erlbaum, McClure, S.M., Laibson, D.I., Loewenstein, G. & Cohen, J.D. (2004). Separate neural systems value immediate and delayed monetary rewards. *Science, 306,* (5695), 503-507. doi:10.1126/science.1100907

McCrae, R.R., Terracciano, A., & 78 Members of the Personality Profiles of Cultures Project (2005). Universal features of personality traits from the observer's perspective: Data from 50 cultures. *Journal of Personality and Social Psychology, 88,* 547–561. doi:10.1037/0022-3514.88.3.547

McLean, C. P., & Anderson, E. R. (2009). Brave men and timid women? A review of the gender differences in fear and anxiety. *Clinical Psychology Review, 29*, 496-505. doi:10.1016/j.cpr.2009.05.003

Meda, S.A., Stevens, M.C., Potenza, M.N., Pittman, B., Gueorguieva, R., Andrews, M.M., et al. (2009). Investigating the behavioral and self-report constructs of impulsivity domains using principal component analysis. *Behavioral Pharmacology, 20,* 390-399. doi:10.1097/FBP.0b013e32833113a3

Meyer-Lindenberg, A., Buckholtz, J.W., Kolachana, B.R., Hariri, A., Pezawas, L., Wabnitz, A., et al. (2006). Neural mechanisms of genetic risk for impulsivity and violence in humans. *Proceedings of the National Academy of Sciences of the United States of America, 103,* 6269-6274. doi:10.1073/pnas.0511311103

Miettunen, J., Veijola, J., Lauronen, E., Kantojarvi, L., & Joukamaa, M. (2007). Sex differences in Cloninger's temperament dimensions: A meta-analysis. *Comprehensive Psychiatry, 48,* 161-169. doi:10.1016/j.comppsych.2006.10.007

Milich, R., & Kramer, J. (1984). Reflections on impulsivity: An empirical investigation of impulsivity as a construct. In K. Gadow and I. Bialer (Eds.), *Advances in learning and behavioral disabilities* (Vol. 3, pp. 57-94). Greenwich, CT: JAI Press.

Miller, E., Joseph, S., & Tudway, J. (2004). Assessing the component structure of four self-report measures of impulsivity. *Personality and Individual Differences, 37,* 349-358. doi:10.1016/j.paid.2003.09.008

Mitchell, J.T., Kimbrel, N.A., Hundt, N.E., Cobb, A.R., Nelson-Gray, R.O., & Lootens, C.M. (2007). An analysis of Reinforcement Sensitivity Theory and the Five-Factor model. *European Journal of Personality, 21,* 869–887. doi:10.1002/per.644

Mitchell, S.H. (1999) Measures of impulsivity in cigarette smokers and non-smokers. *Psychopharmacology, 146,* 455-464. doi:10.1007/PL00005491

Mobini, S., Grant, A., Kass, A.E., & Yeomans, M.R. (2007). Relationships between functional and dysfunctional impulsivity, delay discounting and cognitive distortions. *Personality and Individual Differences, 43,* 1517-1528. doi:10.1016/j.paid.2007.04.009

Moffitt, T.E., Caspi, A., Rutter, M., & Silva, P.A. (2001). *Sex differences in antisocial behaviour: Conduct disorder, delinquency and violence in the Dunedin longitudinal study*. Cambridge: Cambridge University Press. doi:10.1017/CBO9780511490057

Mogg, K., Bradley, B. P., Dixon, C., Fisher, S., Twelftree, H., & McWilliams, A. (2000). Trait anxiety, defensiveness and selective processing of threat: An investigation using two measures of attentional bias. *Personality and Individual Differences, 28,* 1063−1077. doi:10.1016/S0191-8869(99)00157-9

Muraven, M., & Baumeister, R.F. (2000). Self-regulation and depletion of limited resources: Does self-control resemble a muscle? *Psychological Bulletin, 126,* 247-259. doi:10.1037/0033-2909.126.2.247

Murray, K. T., & Kochanska, G. (2002). Effortful control: Factor structure and relation to externalizing and internalizing behaviors. *Journal of Abnormal Child Psychology, 30(5), 503-514*

Nakhaie, M. R., Silverman, R. A., & LaGrange, T. C. (2000). Self-control and social control: An examination of gender, ethnicity, class, and delinquency. *Canadian Journal of Criminology, 25*, 35-59. doi:10.2307/3341910

Newman, J.P., MacCoon, D.G., Vaughn, L.J. & Sadeh, N. (2005). Validating a distinction between primary and secondary psychopathy with measures of Gray's BIS and BAS constructs. *Journal of Abnormal Psychology, 114,* 319-323. doi:10.1037/0021-843X.114.2.319

Newman, J. P., Widom, C. S., & Nathan, S. (1985). Passive-avoidance in syndromes of disinhibition: Psychopathy and extraversion. *Journal of Personality and Social Psychology, 48*, 1316-1327. doi:10.1037/0022-3514.48.5.1316

Nigg, J. T. (2001). Is ADHD a disinhibitory disorder? *Psychological Bulletin, 127,* 571-598.10.1037//0033-2909.127.5.571

Norris, F. H., Matthews, B. A., & Riad, J. K. (2000). Characterological, situational, and behavioral risk factors for motor vehicle accidents: A prospective examination. *Accident Analysis and Prevention, 32,* 505-515 doi:10.1016/S0001-4575(99)00068-8

Offer, D., Ostrov, E., and Howard, K. I. (1982). *The Offer Self-Image Questionnaire for Adolescents: A Manual.* Chicago: Michael Reese Hospital.

Pampel, F. C. (2001). Gender equality and the sex differential in mortality from accidents in high income nations. *Population Research and Policy Review, 20,* 397-421

Parsey, R., Oquendo, M., Simpson, N., Ogden, R., Heertum, R.V., Arango, V., et al. (2002). Effects of sex, age and aggressive traits in man on brain serotonin 5-HT1A receptor binding potential measured by PET using [C-11]WAY-100635. *Brain Research, 954,* 173-182.

Patterson, C.M., & Newman, J.P. (1993). Reflectivity and learning from aversive events: Toward a psychological mechanism for the syndromes of disinhibition. *Psychological Review, 100*, 716-736. doi:10.1037/0033-295X.100.4.716

*Patton, J.H., Stanford, M.S., & Barratt, E.S. (1995). Factor structure of the Barratt Impulsiveness Scale. *Journal of Clinical Psychology*, *51,* 768-719. doi:10.1002/1097-4679(199511)51:6<768::AID-JCLP2270510607>3.0.CO;2-1

Paulsen, K., & Johnson, M. (1980). Impulsivity: A multidimensional concept with developmental aspects. *Journal of Abnormal Child Psychology, 8*, 269-277. doi:10.1007/BF00919070

Penke, L., Denissen, J. J. A., & Miller, G. F. (2007). The evolutionary genetics of personality. *European Journal of Personality, 21*, 549-587. 10.1002/per.629.

Perkins, A., & Corr, P. J. (2006). Reactions to threat and personality: Psychometric differentiation of intensity and direction dimensions of human defensive behavior. *Behavioral and Brain Research, 169,* 21−28. doi:10.1016/j.bbr.2005.11.027

Piquero, A. R., & Rosay, A. B. (1998). The reliability and validity of Grasmick et al.'s self-control scale: A comment on Longshore et al. *Criminology, 36*, 157-174. doi:10.1111/j.1745-9125.1998.tb01244.x

Plavcan, J. M. (2001). Sexual dimorphism in primate evolution. *Yearbook of Physical Anthropology, 44,* 25-53.

Plotkin, H. (1997). *Darwin machines and the nature of knowledge.* Harvard, Mass: Harvard University Press.

Porteus, S.D. (1950). *The Porteus Maze Test and intelligence*. Pacific Books, Palo Alto.

Posner, M.I., & Rothbart, M.K. (2009). Toward a physical basis of attention and self-regulation. *Physics of Life Reviews, 6,* 103-120. doi:10.1016/j.plrev.2009.02.001

Pratt, T. C., & Cullen, F. T. (2000). The empirical status of Gottfredson and Hirschi's general theory of crime: A meta-analysis. *Criminology, 38*, 931-964. doi:10.1111/j.1745-9125.2000.tb00911.x

Quilty, L. C., & Oakman, J. M. (2004). The assessment of behavioural activation: The relationship between impulsivity and behavioural activation. *Personality and Individual Differences, 37*, 429–442. doi:10.1016/j.paid.2003.09.014

*Quiroga, M.A., Hernandez, J.M., Rubio, V., Shih, P.C., Santacreu, J., & Howard, V.N. (2007). Influence of impulsivity-reflexivity when testing dynamic spatial ability: Sex and g differences. *The Spanish Journal of Psychology, 10,* 294-302.

Reitan R. M. (1958). Validity of the Trail Making test as an indicator of organic brain damage. *Perceptual and Motor Skills, 8,* 271-276. doi:10.2466/PMS.8.7.271-276

*Reynolds, B., Ortengren, A., Richards, J.B., & de Wit, H. (2006). Dimensions of impulsive behaviour: Personality and behavioural measures. *Personality and Individual Differences, 40,* 305-315. doi:10.1016/j.paid.2005.03.024

Reynolds, B., Penfold, R.B., & Patak, M. (2008). Dimensions of impulsive behavior in adolescents: Laboratory behavioral assessments. *Experimental and Clinical Psychopharmacology, 16,* 124–131. doi: 10.1037/1064-1297.16.2.124

*Reynolds, B., Richards, J.B., & de Wit, H. (2006). Acute-alcohol effects on the experiential discounting task (EDT) and a question-based measure of delay discounting. *Pharmacology, Biochemistry and Behavior, 83,* 194-202. doi:10.1016/j.pbb.2006.01.007

Richards, J. B., Zhang, L., Mitchell, S. H., & de Wit, H. (1999). Delay or probability discounting in a model of impulsive behavior: Effect of alcohol. *Journal of the*

Experimental Analysis of Behavior, 71(2), 121-143. doi:10.1901/jeab.1999.71-121

Roberts, A.C., Robbins, T.W., & Everitt, B.J., (1988). The effects of intradimensional and extradimensional shifts on visual discrimination learning in humans and nonhuman primates. *Quarterly Journal of Experimental Psychology Section B, Comparative and Physiological Psychology,* 40, 321–341.

Robinson, V. (2008). Everyday masculinities and extreme sports: Male identity and rock climbing. Oxford: Berg.

Rodriguez-Fornells, A., Lorenzo-Seva, U., & Andres-Pueyo, A. (2002). Are high-impulsive and high risk-taking people more motor disinhibited in the presence of incentive? *Personality and Individual Differences, 32, 661-683.*

Rolls, E. T. (2000). The orbitofrontal cortex and reward. *Cerebral Cortex, 10,* 284–294.

Rood, L., Roelofs, J., Bogels, S., Nolen-Hoeksema, S. & Schouten, E. (2009). The influence of emotion-focused rumination and distraction on depressive symptoms in non-clinical youth: A meta-analytic review. *Clinical Psychology Review, 29,* 607–616. doi:10.1016/j.cpr.2009.07.001

Ross, S.R., Molto, J., Poy, R., Segarra, P. Pastor, M.C. & Montanes, S. (2007). Gray's model and psychopathy: BIS but not BAS differentiates primary from secondary psychopathy in noninstitutionalized young adults. *Personality and Individual Differences, 43,* 1644-1655. doi:10.1016/j.paid.2007.04.020

Rothbart, M.K. (2007). Temperament, development and personality. *Current Directions in Psychological Science, 16,* 207-212. doi:10.1111/j.1467-8721.2007.00505.x

Rothbart, M.K., Ahadi, S.A., & Evans, D.E. (2000). Temperament and personality: Origins and outcomes. *Journal of Personality and Social Psychology, 78,* 122-135. doi:10.1037/0022-3514.78.1.122

Rothbart, M.K., & Bates, J.E. (2006). Temperament. In W. Damon, R. Lerner, & N. Eisenberg (Eds.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (6th ed., pp. 99–166). New York: Wiley.

Rothbart, M.K., & Derryberry, D. (1981). Development of individual differences in temperament. In M.E. Lamb & A. Brown (Eds.), *Advances in developmental psychology* (Vol. 1, pp. 37–86). Hillsdale, NJ: Erlbaum.

Rothbart, M.K., & Posner, M.I. (2006). Temperament, attention, and developmental psychopathology. In D. Cicchetti & D. Cohen (Eds.), *Developmental psychopathology: Vol. 2. Developmental Neuroscience* (2nd ed., pp. 465–501). New York: Wiley.

Schalling, D. (1978). Psychopathy-related personality variables and the psychophysiology of socialization. In R.D. Hare & D. Schalling (Eds.) *Psychopathic behaviour: Approaches to research,* pp. 85-106. Chichester: John Wiley and Sons.

Schmitt, D.P., Realo, A., Voracek, M., & Allik, J. (2008). Why can't a man be more like a woman? Sex differences in Big Five personality traits across 55 cultures. *Journal of Personality and Social Psychology, 94,* 168–182. doi: 10.1037/a0014651

Schulze, R. (2004). *Meta-analysis: A comparison of approaches.* Lower Saxony, Germany: Hogrege & Huber.

Shallice, T. (1982). Specific impairments of planning. *Philosophical Transactions of the Royal Society of London Series B-Biological Sciences, 298*, 199-209. doi:10.1098/rstb.1982.0082

Shepherd, J. (1990). Violent crime in Bristol - an Accident and Emergency Department perspective. *British Journal of Criminology, 30*, 289-305

Smillie, L.D. (2008). What is reinforcement sensitivity? Neuroscience paradigms for approach-avoidance process theories of personality. *European Journal of Personality, 22*, 359-384. doi:10.1002/per.674

Smith, G. T., Fischer, S., Cyders, M. A., Annus, A. M., Spillane, N. S., & McCarthy, D.M. (2007). On the validity and utility of discriminating among impulsivity-like traits. *Assessment, 14,* 155-170. doi:10.1177/1073191106295527

Smith, C. L., & Hantula, D. A. (2008). Methodological considerations in the study of delay discounting in intertemporal choice: A comparison of tasks and modes. *Behavior Research Methods, 40, 940-953*. 10.3758/brm.40.4.940

Stanford, M.S., Mathias, C.W., Dougherty, D.M., Lake, S.L., Anderson, N.E., & Patton, J.H. (2009). Fifty years of the Barratt Impulsiveness Scale: An update and review. *Personality and Individual Differences, 47*, 385-393. doi:10.1016/j.paid.2009.04.008

Sternberg, L. (2007). Risk taking in adolescence: New perspectives from brain and behavioral science. *Current Directions in Psychological Science, 16,* 55-59. doi:10.1111/j.1467-8721.2007.00475.x

Stroop, J.P. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology, 18,* 643-662.

Strüber, D., Luck, M., & Roth, G. (2008). Sex, aggression and impulse control: An integrative account. Neurocase, 14(1), 93-121. 10.1080/13554790801992743.

Su, R., Rounds, J., & Armstrong, P.I. (2009). Men and things, women and people: A meta-analysis of sex differences in interests. *Psychological Bulletin, 135,* 859-884. doi:10.1037/a0017364

Swann, A.C., Bjork, J.M., Moeller, F.G., & Dougherty, D.M. (2002). Two models of impulsivity: Relationship to personality traits and psychopathology. *Biological Psychiatry, 51,* 988-994. doi:10.1016/S0006-3223(01)01357-9

Swanson, M.C.J., Bland, R.C., & Newman, S.C. (1994). Antisocial personality disorders. *Acta Psychiatrica Scandinavica, 89,* 63-70. doi:10.1111/j.1600-0447.1994.tb05792.x

Tangney, J.P., Baumeister, R.F., & Boone, A.L. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality, 72,* 271-324. doi:10.1111/j.0022-3506.2004.00263.x

Taylor, S. E., Klein, L. C., Lewis, B. P., Gruenewald, T. L., Gurung, R. A. R., & Updegraff, J. A. (2000). Biobehavioral responses to stress in females: Tend-and-befriend, not fight-or-flight. *Psychological Review, 107, 411-429.* doi:10.1037/0033-295X.107.3.411

Tellegen, A. (1982). Brief manual for the Differential Personality Questionnaire. University of Minnesota Press.

Tittle, C. R., Ward, D. A., & Grasmick, H. G. (2003). Gender, age, and crime/deviance: A challenge to self-control theory. *Journal of Research in Crime and Delinquency, 40,* 426–453. doi:10.1177/0022427803256074

*Torrubia, R., Avila, C., Molto, J., & Caseras, X. (2001). The Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ) as a measure of Gray's anxiety and impulsivity dimensions. *Personality and Individual Differences, 31,* 837-862. doi:10.1016/S0191-8869(00)00183-5

U.S. Department of Justice (n.d.). *Crime in the United States, 2008.* Retrieved March 15, 2010, from http://www.fbi.gov/ucr/cius2008/data/table_42.html

Voyer, D., Voyer, S., & Bryden, M. P. (1995). Magnitude of sex-differences in spatial abilities: A meta-analysis and consideration of critical variables. *Psychological Bulletin, 117, 250-270.*

Wallace, J.F., Malterer, M.B., & Newman, J.P. (2009). Mapping Gray's BIS and BAS constructs onto Factor 1 and Factor 2 of Hare's Psychopathy Checklist - Revised. *Personality and Individual Differences, 47,* 812-816. doi:10.1016/j.paid.2009.06.019

White, J.L., Moffitt, T.E., Caspi, A., Bartusch, D.J., Needles, D.J., & Stouthamer-Loeber, M. (1994). Measuring impulsivity and examining its relationship to delinquency. *Journal of Abnormal Psychology, 103,* 192-205. doi:10.1037/0021-843X.103.2.192

Whiteside, S.P., & Lynam, D.R. (2001). The Five Factor model and impulsivity: Using a structural model of personality to understand impulsivity. *Personality and Individual Differences, 30,* 669-689. doi:10.1016/S0191-8869(00)00064-7

Wilding, J., Pankhania, P., & Williams, A. (2007). Effects of speed and accuracy instructions on performance in a visual search task by children with good or poor attention. *British Journal of Psychology, 98,* 127-139. doi:10.1348/000712606X109666

Wilson, M., & Daly, M. (1985). Competitiveness, risk taking and violence: The young male syndrome. *Ethology and Sociobiology, 6,* 59-73. doi:10.1016/0162-3095(85)90041-X

Wilson, M. & Daly. M. (1997). Life expectancy, economic hardship, homicide and reproductive timing in Chicago neighbourhoods. *British Medical Journal, 314,* 1271-1274.

Wood, J.L., Heitmiller, D., Andreason, N.C., & Nopoulos, P. (2008). Morphology of the ventral frontal cortex: Relationship to femininity and social cognition. *Cerebral Cortex, 18,* 534-540. doi:10.1093/cercor/bhm079

Wood, P. B., Pfefferbaum, B., & Arneklev, B. J. (1993). Risk-taking and self-control: Social psychological correlates of delinquency. *Journal of Crime and Justice, 16,* 111– 130.

Zelenski, J.M., & Larsen, R.J. (1999). Susceptibility to affect: A comparison of three personality inventories. *Journal of Personality, 67,* 761-791. doi: 10.1111/1467-6494.00072

Zuckerman, M. (1971). Dimensions of sensation seeking. *Journal of Consulting and Clinical Psychology, 36*(1), 45-52. doi:10.1037/h0030478

Zuckerman, M. (1979). Sensation seeking: Beyond the optimal level of arousal. Hillsdale, NJ: Erlbaum

Zuckerman, M. (1989). Personality in the third dimension: A psychobiological approach. *Personality and Individual Differences, 10,* 391-418. doi:10.1016/0191-8869(89)90004-4

Zuckerman, M. (1994). *Behavioral expressions and biosocial bases of sensation seeking.* New York: Cambridge University Press. doi:10.1016/B0-08-043076-7/01772-1

Zuckerman, M. (2006). *Sensation seeking and risky behavior.* Washington DC: American Psychological Association. doi:10.1037/11555-000

Zuckerman, M., & Cloninger, C. R. (1996). Relationships between Cloninger's, Zuckerman's, and Eysenck's dimensions of personality. *Personality and Individual Differences,* 21, 283–285. doi:10.1016/0191-8869(96)00042-6

Zuckerman, M., & Kuhlman, D.M. (n.d.). *Norms for the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ).* Newark, Delaware: University of Delaware.

Zuckerman, M., & Kuhlman, D.M. (2000). Personality and risk-taking: Common biosocial factors. *Journal of Personality* 68, 999-1029. doi:10.1111/1467-6494.00124

Zuckerman, M., Kuhlman, D.M., Joireman, J., Teta, P., & Kraft, M. (1993). A comparison of three structural models for personality: The Big Three, the Big Five and the Alternative Five. *Journal of Personality and Social Psychology, 65*, 757-768. doi:10.1037/0022-3514.65.4.757

CHAPTER THREE

Do Aggression and Sociosexuality Share a Common Proximate Mechanism?

Chapter Two presented evidence that sex differences in impulsivity depend on the measurement instrument used. It was concluded that risky impulsivity was a form of impulsivity which might be better suited to the study of sex differences in aggression than traditional trait impulsivity or sensation seeking measures. In this chapter, risky impulsivity is evaluated as a proximate psychological mechanism for sex differences in both direct aggression and sociosexuality. Sociosexuality is – like direct aggression – considered in terms of the costs of action and restraint for men and women.

Sex Differences in Sociosexuality

Sociosexuality refers to a stable individual difference in sexual behaviour. Those with a restricted sociosexuality – reflected in low scores on the Sociosexuality Inventory (SOI; Simpson & Gangestad, 1991) – desire few sexual partners, change sexual partners infrequently, and prefer to have sex with a new partner only when in a close and committed relationship. Conversely, those with an unrestricted sociosexuality – indexed by high SOI scores – desire many sexual partners, change sexual partners frequently, and do not feel that they need to be in a close and committed relationship in order to enjoy sex (Simpson & Gangestad, 1991). Sociosexuality is not simply sex drive; although the two constructs are correlated, sociosexuality predicts the number of sexual partners a person will have independently of, and more accurately than, their sex drive (Ostovich & Sabini, 2004). It is also associated with sexual infidelity in relationships (Penke & Asendorpf, 2008).

In a study of sex differences in sociosexuality across 48 different nations, men were found to have significantly higher SOI scores than women in every nation (Schmitt, 2005b). Furthermore, men have more positive feelings than women about short-term sexual encounters (Campbell, 2008), are more likely to seek additional sexual partners (Schmitt, 2003), and are more likely to consent to sex with strangers (Clark & Hatfield, 1989). All of this indicates that men pursue mating opportunities with a variety of partners more than women do.

Sex differences in the costs of sociosexuality. As discussed in Chapter One, the obligate costs of a successful fertilisation end with copulation for men, while for women they persist through a lengthy and metabolically demanding gestation. Furthermore, women are unable to invest in a new, potentially better, reproductive opportunity until this gestation (and a period of lactation if the infant is to survive) has ended. From an evolutionary perspective, a logical strategy for men is to exploit women’s greater obligate parental investment wherever possible by pursuing mating opportunities relatively indiscriminately (Trivers, 1972).

Sexual activity also carries potential reputational costs for women but not for men (Campbell, 2002; Jonason & Fisher, 2009). D. M. Buss (1989) reported that men, but not women, value signs that a potential long-term partner has had little sexual experience. Men’s willingness to consider a long-term relationship with a female partner is negatively influenced by her having a large number of previous partners (Jonason, 2007). Sexual activity therefore leaves girls and women open to damaging judgements about their value as long-term mates, while boys and men are likely to have their status enhanced by claiming multiple partners (Duncan, 1999; Jonason, 2007; Lees, 1993).

The physical risks associated with sex are also greater for women than for men. Sexually transmitted infections pass more easily from men to women than from women to men (Devincenzi et al., 1992). In humans and other primates, females risk injury at the hands of over-eager or aggressive mates and these dangers are likely to increase as the number of mates increases (Franklin, 2010; Gomendio, Harcourt, & Roldán, 1998; Koss & Dinero, 1989). Women are sensitive to this risk: A study of bar patrons found that 52% of women said they would fear being physically harmed if they were alone with someone they had just met, compared to only 7% of men (Herold & Mewhinney, 1993). All of this suggests that the women weight the costs of sex with a new partner higher than men do, which in turn means that men will favour an opportunistic approach to mating to a greater extent than women, while women have a greater tendency to favour restraint over action.

Commonalities between sex and aggression

The sex differences in sociosexuality and same-sex aggression are two of the most robust and marked sex differences in the psychological literature. Both of these sex differences have been approached using an evolutionary framework and both have been explained with regard to sex differences in parental investment. A single psychological mechanism mediating the two forms of behaviour would therefore serve two adaptive functions. Aside from the fact that both forms of behaviour are highly relevant to reproductive fitness and both can be considered in terms of a cost-benefit analysis, same-sex aggression and sociosexuality share two other features which suggest a common psychological mechanism. These are discussed in the following paragraphs.

Sex and aggression share an appetitive component. Since the *sine qua non* of fitness is reproduction, an inclination to mate is certainly adaptive, even if this drive must be balanced against the pursuit of other important survival-maintaining behaviours such as foraging or parenting. Regardless of whether the strength of sex drive or the optimal mating rate differs between men and women, the urge to copulate – at least periodically – is adaptive for both sexes (Buller, 2005; Symons, 1979). There is evidence that aggression also has an appetitive motivation. Carver and Harmon-Jones (2009) argue that anger, which is strongly linked to aggression, is related to approach motivation systems. Indeed, the argument that aggression results from the blockage of goal-directed behaviour (see, e.g. Berkowitz, 1989) or as a strategy for resource competition (Campbell, 1995; Daly & Wilson, 1988) suggests the involvement of appetitive motivational systems. Furthermore, aggression correlates positively with scores on scales designed to measure general behavioural activation and approach tendencies (Smits & Kuppens, 2005).

With regard to both aggression and sociosexuality, therefore, both men and women will have a natural tendency to experience impulses towards action. The inherent benefits of action, whether the sequestering of resources or status that come with successful aggression or the reproductive fitness payoffs of a successful copulation, mean that both sex and aggression are inherently attractive. As with crime (Gottfredson & Hirschi, 1990), the question is not why people sometimes participate but why they sometimes do not. This suggests a role for impulse control in explaining individual differences in both of these behaviours.

Sex and aggression share links with impulsivity. As we have seen, traits related to impulsivity have been related to aggression and violent delinquent behaviour (Campbell, 2006; Garcia-Forero, Gallardo-Pujol, Maydeu-Olivares, & Andres-Pueyo, 2009; Gottfredson & Hirschi, 1990; Moffitt, Krueger, Caspi, & Fagan, 2000; Ramirez & Andreu, 2006; Smith & Waterman, 2006; Strüber, Luck, & Roth, 2008; Vigil-Colet, Morales-Vives, & Tous, 2008). Given that both aggressive and sexual behaviour require that potential costs be weighed against potential rewards,, it is reasonable to suppose that traits related to the control of urges should be relevant in predicting individual differences in both.

Impulsivity and sensation seeking correlate with sexual risk taking (Hoyle, Fejfar, & Miller, 2000), although the effect is larger for sensation seeking than impulsivity. Impulsive sensation seeking (a measure which combines impulsivity and sensation seeking items) is correlated with a measure of sexual risk taking which includes an index of partner number (Zuckerman & Kuhlman, 2000). The Experience Seeking and Thrill and Adventure seeking subscales of Zuckerman's Sensation Seeking Scale correlate positively with Pérusse's (1993) measure of potential conceptions – an index which combines partner number and frequency of copulation. A Danish version of the Sensation Seeking Scale has also been found to correlate with a range of sexual behaviours (Ripa, Hansen, Mortensen, Sanders, & Reinisch, 2001). Seal and Agostinelli (1994) found that SOI was negatively related to scores on MPQ Control (which is associated with low impulsivity) and positively related to impulsive risk seeking, while Gangestad and Simpson (1990) found that sociosexuality was negatively correlated with harm avoidance in women.

Turning to the Big Five traits, sexual promiscuity and sexual infidelity are positively correlated with extraversion and negatively related to agreeableness and conscientiousness (Schmitt, 2004). SOI scores are correlated with these three facets of personality in the same way (Schmitt & Shackelford, 2008). These correlations, however, are typically in the range of .1 to .2. Furthermore, impulsivity is difficult to align with the Big Five traits: facets of impulsivity load variously on extraversion, conscientiousness, and neuroticism. Thus, the evidence from studies using the Big Five suggest a role of personality in predicting sexual behaviour, but are merely suggestive of an effect of impulsivity.

The Present Study

The commonalities between direct aggression and sociosexuality suggest that they might have a common proximate psychological mechanism. The following paper, therefore, evaluated risky impulsivity as a predictor of both same-sex aggression and sociosexuality. The factor structure of risky impulsivity was also examined in a large community sample. Because evolutionary approaches to explaining sex differences in aggression discussed above focus on intrasexual competition, the following paper focuses on same-sex as opposed to opposite-sex aggression. Data on opposite-sex aggression appear as a supplementary analysis later in the Chapter.

Sex Differences in Same-Sex Aggression and Sociosexuality: The Role of Risky Impulsivity

Catharine P. Cross

Durham University

Evolutionary Psychology, 8, 779-792 (2010)

Abstract

Sex differences in same-sex direct aggression and sociosexuality are among the most robust in the literature. The present paper evaluated the hypothesis that both can be explained by a sex difference in the willingness to take impulsive risks. Self-report data were gathered from 3,775 respondents (1,514 female) on same-sex aggression, sociosexuality, and risky impulsivity. Risky impulsivity was higher for men than for women (d = .34) and path analysis showed it to be a common cause of same-sex aggression and sociosexuality for both sexes. However, it did not completely mediate the sex differences in same-sex aggression and sociosexuality. The results suggest that same-sex aggression and sociosexual behaviour share a common psychological mechanism, but that fully explaining sex differences in aggression requires a more sensitive assay of impulsive risk and a consideration of dyadic processes.

The phrase *direct aggression* refers to acts that are intended to harm or injure and which occur in the presence of both the aggressor and target (A. H. Buss, 1961). It may be physical (e.g. a punch) or verbal (e.g. an insult), but in both cases the target is able to identify the aggressor and retaliate immediately. The possibility of immediate retaliation is what makes direct aggression distinct from indirect aggression, which is delivered via circuitous means and hence conceals the identity of the aggressor (Archer & Coyne, 2005).

Sex differences in the use of direct aggression appear in the first two years of life and persist through childhood and adolescence (Card, Stucky, Sawalani, & Little, 2008), although there is always some overlap between male and female distributions. As adults, men use more direct aggression than women in laboratory settings (Bettencourt & Miller, 1996), as well as in real life settings whether measured by self report (Archer, 2004) or by frequencies of arrest for violent crime (Roe, Coleman, & Kaiza, 2009). The sex difference in direct aggression is consistent across cultures (Archer, 2009; Campbell, 1999) and time periods (Daly & Wilson, 1988). In contrast, indirect aggression does not show consistent sex differences in adults (Archer, 2004). Because this paper is concerned with sex differences, the focus will be on direct as opposed to indirect aggression (and the term *aggression* will refer to direct aggression). This paper also focuses on same-sex, as opposed to opposite-sex, aggression. Aggression towards opposite-sex targets does not show a robust sex difference in the male direction (Archer, 2004; Cross, Tee, & Campbell, 2011), and evolutionary accounts of sex differences in aggression have focused on the role of sex-specific selection pressures on same-sex aggression (Campbell, 1999; Daly & Wilson, 1988).

Sex differences in same-sex aggression: Evolutionary accounts. Daly and Wilson (1988) explained men's high levels of same-sex aggression as follows. Social status and access to sexual partners are a crucial limiting factor in men's, but not women's, reproductive success – the number of offspring who survive to maturity to reproduce themselves. Furthermore, there is greater variance in reproductive success for men than for women (see Brown, Laland, & Mulder, 2009, for a review), with men being more likely than women to fail to reproduce at all. Although for men who engage in aggression there is a chance of being injured or killed, men who fail to secure a mate face reproductive death regardless of how long they themselves stay alive. This threat of reproductive death is sufficiently dire to make risky, aggressive competition adaptive even when potential costs are high (see Wang, 2002). Although Daly and Wilson's (1988) analysis is outlined here in terms of the costs of failing to compete, this argument is often discussed in terms of men's rewards for competing successfully (e.g. "Bigger prizes warrant bigger gambles." Daly & Wilson, 1988, p. 163).

In a contrasting analysis, Campbell (1999) argued that women's low levels of aggression are not merely the absence of the adaptation for aggression found in men, but are themselves an adaptation to safeguard physical integrity. Although women stand to gain little from competing for numbers of mates, they have much to compete for in terms of securing the best quality mates or sequestering food resources for provisioning their offspring: Women's levels of same-sex aggression, although always lower than men's, are sensitive to resource shortage in the same way (Campbell, Muncer, & Bibel, 2001). However, there is a stronger selection pressure on women than on men to avoid physical injury because infants are considerably more dependent on mothers than on fathers. The detrimental effect of maternal death on infant survival is much stronger and more consistent than the effect of paternal death (Sear & Mace, 2008). Consequently, women's own physical integrity is more tightly bound to their reproductive success as a whole than men's, and the resulting selection pressures drive down women's engagement in aggression.

Sex differences in sociosexuality. Sex differences in sociosexuality, like sex differences in aggression, are marked and robust across cultures (Schmitt, 2005a). Sociosexuality measures a tendency to change sexual partners frequently, to desire large numbers of sexual partners, and to require little or no emotional intimacy in order to have sex (Simpson & Gangestad, 1991). Men in every region of the world desire a greater number of sexual partners than women do and are more likely to report actively seeking short-term sexual partners (Schmitt, 2003). Men report a greater interest in casual sex than women do (Oliver & Hyde, 1993; Petersen & Hyde, 2010), require less time than women do before consenting to sex with a new partner (Schmitt, Shackelford, & Buss, 2001) and, after one-night stands, experience fewer feelings of regret (Campbell, 2008).

Sociosexuality, like aggression, is a form of behaviour for which the cost-benefit trade-off differs for men and women. (Mulder & Rauch, 2009; Penn & Smith, 2007). Women bear greater metabolic costs following a successful conception than men do, and their ability to make other, potentially better, investments in offspring is limited for much longer. This makes the consequences of a poor choice of partner more severe for women than for men (Bjorklund & Kipp, 1996; Trivers, 1972). Men have more to gain then women from mating with additional partners (Jokela, Rotkirch, Rickard, Pettay, & Lummaac, 2010), and women suffer reputational costs from unrestricted sexual activity which men do not (Jonason, 2007). Sexually transmitted infections pass more easily from men to women than from women to men (Devincenzi et al., 1992). Furthermore, women are approximately ten times more likely than men to be raped or sexually assaulted (Roe et al., 2009), and an increased number of sexual partners increases the risk that at least one partner will be sexually aggressive (Franklin, 2010). Again, this suggests that the optimally adaptive level of engagement in sexual activity is higher for men than for women.

A common proximate mechanism? Same-sex aggression and sociosexuality, therefore, both show robust and marked sex differences which are argued to be the result of differing selection pressures on men and women. For both forms of behaviour, the optimal level of involvement is higher for men than for women. I therefore postulate that a single proximate psychological mechanism might underlie the sex difference in both same-sex aggression and sociosexuality, and that risky impulsivity is a promising candidate for such a mechanism. The risky impulsivity scale was developed specifically to measure risk-taking which occurs without prior thought (Campbell & Muncer, 2009). In the following paragraphs I outline the conceptual links between risky impulsivity and the proximate mechanisms postulated by previous evolutionary accounts of the sex difference in aggression.

Wilson and Daly (1985) argue that a male “taste for risk” explains men’s greater use of same-sex aggression and there is considerable evidence that men engage in risky pursuits more than women. Men are more likely to take part in extreme sports, for example (Murray, 2003), and this form of risk-taking involves careful planning to minimize the chances of accident. However, men are also overrepresented in illegal drug use (Degenhardt et al., 2008), dangerous driving convictions (Corbett, 2007), and deaths from non-vehicle accidents (Pampel, 2001), which implies that men are also more likely than women to take risks *without* *adequate consideration of the consequences*. This suggests that a measure of risk-taking which occurs without forethought might be instructive in developing an account of sex differences in aggression and sociosexuality.

Campbell (1999) argued that women's higher levels of fear was important in explaining sex differences in aggression, and later outlined a model in which early sex difference in levels of fear lead to later sex differences in impulsivity, which then mediates the sex difference in aggression (Campbell, 2006). More fearful children develop more effective control of their impulses (Kochanska & Knaack, 2003). Impulsivity, therefore, is a construct which is conceptually related to both Wilson and Daly's (1985) and Campbell's (1999) proposed mechanisms for the sex difference in aggression. Furthermore, impulsivity is correlated with involvement in aggressive behaviour (Henry, Caspi, Moffitt, & Silva, 1996; Vigil-Colet et al., 2008) and sexual risk-taking (Hoyle et al., 2000). Risky impulsivity is correlated with aggression (Campbell & Muncer, 2009) and data are suggestive of a correlation with sociosexuality (Boothroyd, Cross, Gray, Coombes, & Gregson-Curtis, 2011).

The present study. The chief aim of the present study is to test risky impulsivity as a possible common mechanism for same-sex aggression and sociosexuality. A secondary aim of the present study was to test the factor structure of risky impulsivity in male and female subsamples separately. The most widely used psychometric measure of impulsivity (Barratt Impulsiveness Scale; Patton, Stanford, & Barratt, 1995) has a factor structure which differs in male and female subsamples (Ireland & Archer, 2008). This is a problem for any scale being used to investigate sex differences, as any quantitative difference in scores between the sexes is confounded with qualitative difference in the structure of the trait. Finally, sex differences in variability in same-sex aggression, risky impulsivity, and SOI were examined. Archer and Mehdikhani (2003) argue that sexual selection produces greater variance in men than in women for sexually selected traits, including aggression. If risky impulsivity and SOI are part of the same sexually selected adaptive complex, then we might expect to see greater male than female variance in risky impulsivity and SOI as well as aggression.

It was hypothesized that risky impulsivity would emerge as a common cause of both same-sex aggression and sociosexuality. Furthermore, it was hypothesized that risky impulsivity would mediate the sex differences in same-sex aggression and sociosexuality. Finally, it was hypothesized that same-sex aggression, SOI, and risky impulsivity would have larger variances in men than in women.

Method

Participants

Participants were 3,775 heterosexual adults (1,514 female) aged between 18 and 65 (mean age = 32.5, SD = 9.3 years), who completed a questionnaire posted on a university website. Ninety-three per cent of the sample classed themselves as European, 2% North American, 2% British, and 3% other.

Measures

Risky impulsivity scale. The 12 items in this scale were derived from exploratory and confirmatory factor analyses of an item pool generated by focus groups (Campbell & Muncer, 2009), and are designed to measure the tendency to behave in potentially dangerous ways without prior thought. Example items are "Have another drink even though I am already drunk," and "Drive too fast when I am feeling upset." Because the main purpose of this instrument was to assess tolerance of general risk rather than aggression, none of the items refer to aggressive acts. Campbell and Muncer (2009) report a Cronbach's alpha of .81 for this scale. Participants were asked "Based on your previous experiences, how likely would you be to do each of these things on impulse?" and indicated their answer using a Likert scale from 1 (very unlikely to do this) to 5 (very likely to do this). The Likert scores for each item were summed to form a scale total.

Sociosexual Orientation Inventory. This seven-item scale was developed by Simpson and Gangestad (1991) and measures an unrestricted attitude towards sexual behaviour. The first three items are free-response self-report items (e.g. "With how many people have you had sex in the last 12 months?"). Because these items can cause scores on the whole scale to be highly skewed, these were recoded onto a 9-point Likert scale, following Penke and Asendorpf (2008).The SOI also has three attitudinal items (e.g. "Sex without love is OK") where participants indicate strength of agreement on a 9-point Likert scale, and an item assessing frequency of sexual desire, which is scored on an 8-point Likert scale. Simpson & Gangestad report a Cronbach's alpha of .73. High SOI scores are associated with having sex early in a relationship, and having sex with more than one partner at a time.

Self-reported same-sex direct aggression. Archer and Webb (2006) compiled a 16-item list of acts of direct aggression from items used in other studies of aggressive behaviour (Gergen, 1990; Harris, 1992; Richardson & Green, 1999). This list included four verbal items (e.g. "screamed at someone") and 12 physical items (e.g. "grabbed someone"). Archer & Webb (2006) reported a Cronbach's alpha of .84 for this scale. In the present study, participants indicated how many times in the last 12 months they had used each of the 16 acts towards someone of their own sex by choosing one of five categories, ranging from "never" to "more than 10 times".

Results

Psychometrics and sex differences

The men in the sample were significantly older than the women, $F(1, 3774) = 46.57$, $p < .001$, the mean difference being 2.1 years. Age is therefore controlled in the following analyses of sex differences.

Sociosexuality. Means and standard deviations for all variables can be found in Table 12. Cronbach's Alpha for the SOI was .79, which is comparable to the value found in Simpson and Gangestad's (1991) original paper. As anticipated, men scored significantly higher than women on the SOI (See Table 12). The variance ratio was significantly larger than 1, indicating greater male variability.

Self-reported aggression. Cronbach's alpha was .89 for same-sex aggression, which is comparable to the value given by Archer and Webb (2006). Table 12 shows that, as hypothesized, men scored significantly higher than women. The variance ratio was significantly larger than 1, indicating greater male variability.

Risky impulsivity. Cronbach's alpha for the 12-item risky impulsivity scale was acceptable at .76, which is similar to the value given by Campbell and Muncer (2009). Men scored significantly higher than women on risky impulsivity (see Table 12), but the variance ratio was not significantly different from 1, indicating no sex difference in variability.

Confirmatory factor analysis was used to test the factor structure of the scale. The model evaluated by Campbell and Muncer (2009) was tested using AMOS 7. This model had three intercorrelated factors: injury risk, criminal risk, and health risk. The estimation method used was maximum likelihood.

Table 12:

Means and standard deviations for risky impulsivity, same-sex aggression, and sociosexuality

Variable	Male Mean (SD)	Female mean (SD)	F (1,3773)	d[a]	Variance ratio[b]
Risky impulsivity	29.01 (7.07)	26.62 (6.95)	105.72***	0.34	1.04
Health subscale	11.35 (3.53)	10.10 (3.52)	165.50***	0.35	1.00
Physical subscale	11.05 (3.36)	10.07 (3.35)	89.45***	0.29	1.01
Criminal subscale	6.62 (2.36)	6.45 (2.31)	10.23**	0.07	1.04
SOI	33.63 (11.31)	27.00 (10.57)	328.42***	0.58	1.14**
Same-sex aggression	17.68 (11.97)	11.34 (8.94)	309.01***	0.56	1.80***

Note: The effect of age is controlled in the analysis of sex differences.

[a]d = a measure of effect size given by (male mean – female mean) / pooled SD. [b]Variance ratio = male variance divided by female variance. Values significantly larger than 1 indicate significantly larger male variance

**p < .01; ***p < .001

The factor structure was confirmed on the male data and female data separately. The fit statistics were more than adequate for both sets of data, $\chi2/df = 8.63$, RMSEA = .058, 90% CI [.053, .063], TLI = .89, CFI = .91 for males; $\chi2/df = 5.39$, RMSEA = .054, 90% CI [.048, .060], TLI = .90, CFI = .92, for females. Inspection of modification indices revealed no alterations that would improve the fit for either males or females. This indicates that risky impulsivity is a trait that manifests itself in the same way for both sexes. The factor loading and mean scores for each item on the risky impulsivity scale can be found in Table 13.

Table 13:

Means, standard deviations and factor loadings for risky impulsivity items, by sex.

Item	Mean (SD)		Factor	Factor loading	
	M	F		M	F
Drive through an amber traffic light	2.82 (1.21)	2.40 (1.17)	Physical injury	.62	.61
Run across the road to beat the traffic if I am in a hurry	3.01 (1.21)	2.80 (1.21)	Physical injury	.65	.58
Drive too fast when I am feeling upset	3.00 (1.13)	2.90 (1.19)	Physical injury	.54	.59
Turn right across oncoming traffic with only just enough time to make it	2.24 (1.03)	2.01 (1.03)	Physical injury	.67	.66
Smoke cannabis if someone offered it to me	2.01 (1.27)	1.74 (1.15)	Health risk	.42	.45
Have another drink when I am already drunk	3.30 (1.29)	3.15 (1.29)	Health risk	.61	.68
Have a one night stand with an attractive stranger	3.21 (1.34)	2.62 (1.31)	Health risk	.57	.60
Have unprotected sex	2.83 (1.29)	2.58 (1.28)	Health risk	.54	.55
Steal something from a shop	1.25 (0.57)	1.18 (0.53)	Criminal risk	.30	.27
Gamble more money than I actually have	1.55 (0.87)	1.48 (0.82)	Criminal risk	.66	.60
Put purchases on a credit card without having enough money to pay it off	1.96 (1.11)	2.14 (1.24)	Criminal risk	.63	.59
Tear up a parking ticket	1.86 (1.03)	1.66 (0.96)	Criminal risk	.35	.37

Correlations

Risky impulsivity was significantly correlated with same-sex aggression and sociosexuality for both men and women (see Table 14). Aggression and sociosexuality were also significantly correlated for both sexes. Risky impulsivity was significantly more strongly related to male-male aggression, $r = .40$, than to female-female aggression, $r = .25$ ($z = 5.06$, $p < .001$).

Table 14.

Intercorrelations between risky impulsivity, sociosexuality, and aggression scales. Correlations for men (N = 2261) above the diagonal: correlations for women (N = 1514) below the diagonal

Scale	Risky Impulsivity	SOI	Same-sex aggression
Risky impulsivity	-	.48	.40[a]
SOI	.49	-	.20
Same-sex aggression	.25[a]	.16	-

Note: All correlations are significant at $p < .001$

[a] Denotes a significant sex difference in the size of the correlation coefficients

Path analysis

In order to test the hypothesis that risky impulsivity drives both sociosexual and aggressive behaviour, three competing path models were tested. In Model 1, risky impulsivity was a common cause of both sociosexuality and same-sex aggression (see Figure 1a). In model 2, SOI was tested as a common cause of risky impulsivity and same-sex aggression. In model 3, same-sex aggression was evaluated as a common cause of risky impulsivity and SOI. It was hypothesised that only model 1 would show a good fit to the data. This model fit the data well for both the male (χ^2/df = 2.83, RMSEA = .00, 90% CI [.00, .05], TLI = 1.00, CFI = 1.00) and the female (χ^2/df = 2.43, RMSEA = .03, 90% CI [.00, .08], TLI = 0.99, CFI = 1.00) subsamples. For models 2 and 3, the fit statistics were very poor (model 2 (male data) χ^2/df = 299.05, RMSEA = .36, 90% CI [.33, .40], TLI = 0.09, CFI = .70; model 2 (female data) (χ^2/df = 61.12, RMSEA = .20, 90% CI [.16, 24], TLI = 0.65, CFI = 0.88; model 3 (male data) χ^2/df = 499.24, RMSEA = .47, 90% CI [.44, .51], TLI = -0.52, CFI = .49; model 3 (female data) χ^2/df = 383.53, RMSEA = .50, 90% CI [.46, .55], TLI = -1.24, CFI = 0.26. This further supports the argument that risky impulsivity is a common cause of direct same-sex aggression and sociosexuality[1].

In order to test the hypothesis that risky impulsivity accounts for the sex differences in same-sex aggression and sociosexuality, sex was incorporated into the path model (see Figure 1b). Although there were statistically significant indirect effects of sex on sociosexuality and same-sex aggression, this model did not fit the data well, χ^2/df = 142.13, RMSEA = .193, 90% CI [.178, .209], TLI = 0.62, CFI = 0.81, and allowing for direct effects of sex on sociosexuality and same-sex aggression improved the model fit significantly, χ^2/df = 1.71, RMSEA = .014, 90% CI [.000, .048], TLI = 1.00, CFI = 1.00; χ^2 change (2) = 424.7, $p < .001$. This suggests that risky impulsivity accounts for some of the between-sex variance in same-sex aggression and sociosexuality, but is not enough to explain it completely.

[1] A further path model was tested in which the subscales of risky impulsivity were treated as separate variables. This expanded path model can be found in Appendix C. This analysis showed that the three subscales of risky impulsivity did not differ in their strength of relationship with same-sex aggression, but that the health subscale predicted significantly more variance in sociosexuality than the other two subscales did.

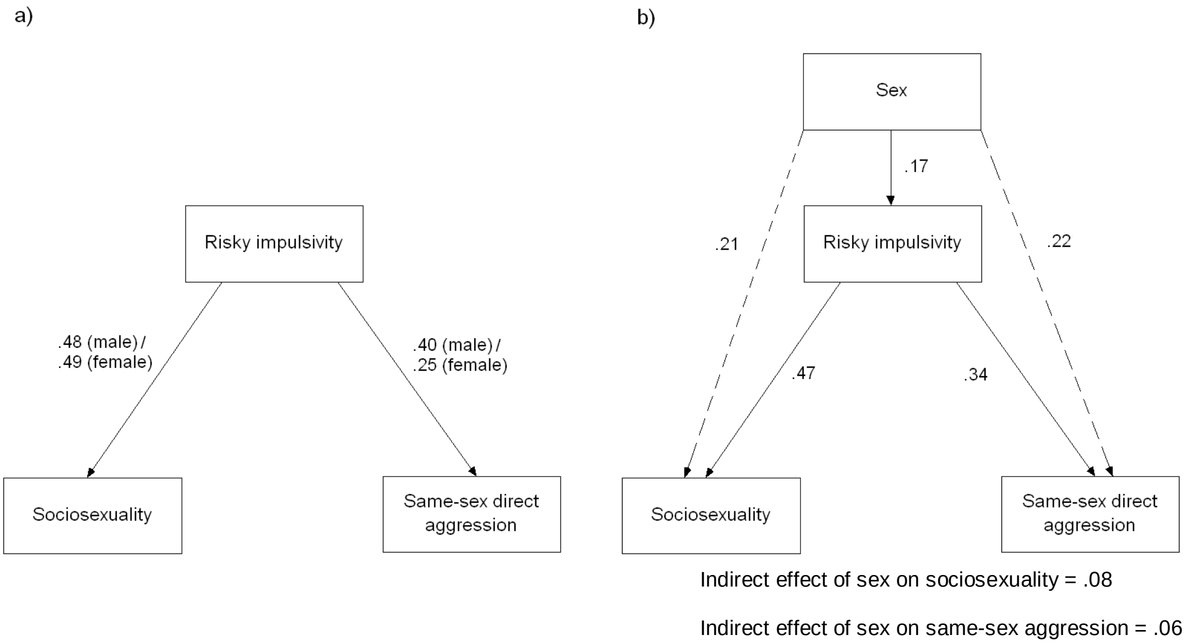

Figure 1. Relationships between: a) risky impulsivity, same-sex aggression and sociosexuality, and b) sex, risky impulsivity, same-sex aggression and sociosexuality. All paths and indirect effects are significant at p < .001. Dashed lines indicate paths that were not originally specified but which were indicated by modification indices. See main text for model fit statistics.

Discussion

The present study sought to evaluate the hypothesis that same-sex aggression and sociosexuality share a common proximate psychological mechanism, namely risky impulsivity, which might also explain sex differences in both of these behaviours. The principal finding of the current study is that risky impulsivity appears to be a common cause of both same-sex aggression and sociosexuality. This implies that the reason these two variables are related is because they share an element of risk, and that risky impulsivity represents a single mechanism which underlies individual differences in behaviour in two distinct domains. Furthermore, this relationship holds in both sexes, indicating that within-sex differences in risky behaviour are mediated by the same mechanisms in men and women.

In terms of evolutionary accounts of same-sex aggression and sociosexuality, the present results suggest that high levels of impulsivity might have been selected in men because they served two adaptive functions at the same time: promoting competition with other males and pursuing mating opportunities. Conversely, low levels of impulsivity might have been adaptive in women not only because they inhibited dangerous intrasexual competition but because they resulted in more cautious and restricted sexual behaviour. Impulsivity was therefore subject to two different forms of sex-specific selection pressure. Sex differences in same-sex aggression and sociosexuality might have evolved concurrently, with impulsivity as a common substrate. A single common mechanism representing a tolerance for impulsive risks would be a more parsimonious account of individual differences in same-sex aggression and sociosexuality – and the correlation between them – than two separate mechanisms governing aggressive and sociosexual behaviour.

The results suggest that risky impulsivity is a measure well suited to investigating sex differences in risky behaviour: There is a significant sex difference in risky impulsivity, and it has a factor structure that is invariant across the sexes. Risky impulsivity, however, did not fully account for the sex differences in same-sex aggression or sociosexuality, despite the evidence that it accounts for significant within-sex variation. The sex difference in risky impulsivity, although significant, is smaller than the sex differences in same-sex aggression and sociosexuality and may therefore not be large enough to account for them. It is possible that risky impulsivity, although a valid measure of individual differences in impulsive risk-taking, is sensitive enough to detect the sex difference but not sensitive enough to reflect its magnitude. Risky impulsivity measures the tendency to take risks that arise commonly in everyday life. Including activities which are slightly more dangerous might produce more substantial sex differences. However, care would need to be taken not to compromise the applicability of the scale to community and student samples who might not have experience of extreme forms of risk-taking.

There was greater male than female variance on same-sex aggression, which is concordant with Archer and Mehdikhani's (2003) argument that men are more free to vary in their parental investment strategies than women. SOI also showed greater male than female variance, which is consistent with the argument that same-sex aggression and SOI might form part of a single adaptive complex. There was no evidence, however, of greater variability among men than women in risky impulsivity. At first blush, this appears inconsistent with the argument that the sex difference in risky impulsivity is the result of sexual selection, despite the strong relationships between risky impulsivity, same-sex aggression, and SOI. However, the absence of items relating to extremely risky activities on the risky impulsivity scale might account for the absence of greater male variance, as well as the lack of complete mediation of the sex difference in same-sex aggression.

Two further factors to consider in explaining the sex difference in same-sex aggression are qualitative differences between male and female same-sex aggression, and the possibility that a mean difference between the sexes has a synergistic effect when looking at male-male compared to female-female dyadic interactions. First, men's conflicts are characterized by a need to preserve face in response to a slight or a threat to status (Felson, 1982). The costs of 'backing down' are greater for men than for women (Wilson & Daly, 1985). Men are more likely than women to use explosive forms of anger expression such as angry shouting or hitting inanimate objects (an effect which is partially mediated by risky impulsivity; Campbell & Muncer, 2008). This form of anger expression might form part of a style of emotion expression characterised by dominance signals (Vigil, 2009). This might, in turn, provoke a counter-threatening response and an upward spiral of aggression: Such a pattern has been found to be characteristic of antagonistic encounters between men, in which 'face' is all-important and high levels of aggression can result from trivial incidents (Daly & Wilson, 1988; Felson, 1982). In contrast, women's conflicts are more likely to be characterized by the use of defusing forms of anger expression such as withdrawing or crying (Campbell & Muncer, 2008), which might form part of a general style of emotion expression characterised by nurturance-eliciting signals (Vigil, 2009). These might be less likely to be perceived as threatening or provoking, making escalation less likely.

Second, research on the escalation of aggressive behaviour in laboratory settings indicates that when individuals with high trait aggressiveness interact, the trait aggressiveness levels of both individuals have additive effects on aggressive escalation (Anderson, Buckley, & Carnagey, 2008). A relatively small mean difference between men and women in risky impulsivity might therefore have large effects when same-sex dyads are considered. This might explain why risky impulsivity is a stronger correlate of same-sex aggression in men than in women. If interactions between men are characterized by greater provocation and have a greater tendency towards escalation than interactions between women, then individual differences in risky impulsivity have greater latitude to affect the behavioural outcome in the former. All of this suggests that an interactionist approach to explaining sex differences in aggression is appropriate. An individual's sex might be a factor in determining their level of tolerance for risk, but it also affects qualitatively the antagonistic encounters in which they are likely to become involved.

There were, of course, some limitations of the present study. Firstly, limiting the scope of inquiry to same-sex aggression means that the role of impulsivity in aggression towards opposite-sex targets could not be addressed. Future work could examine the role of risky impulsivity in partner aggression more closely, particularly in same-sex partnerships which are under-researched. Secondly, the present paper cannot address the role of impulsivity in indirect aggression. It was decided to focus on direct aggression because it carries a risk of immediate retaliation, and sex differences are evident. Impulsivity might be less relevant to indirect aggression in which the aggressor has to maintain sufficient self-control to refrain from direct confrontation and deliver his or her aggressive acts circuitously. Thirdly, because risky impulsivity did not completely account for the sex differences in same-sex aggression and sociosexuality, consideration must be given to other possible mechanisms and how they might interact with risky impulsivity.

To conclude, the present study indicates that same-sex aggression and sociosexuality are correlated because of their shared element of risk, and that sex differences in both behaviours might be the result of sex-specific selection pressures acting on a general tendency to tolerate risk. While risky impulsivity can account for individual differences in both of these behaviours, a more sensitive measure might be needed to reflect the true extent of sex differences in impulsive risk-taking. Individual differences in impulsivity also need to be considered in concert with variables at the dyadic level in order to give a complete account of sex differences in same-sex aggression.

Supplementary Analysis of Opposite-sex Aggression Data

If same-sex aggression and sociosexuality both have impulsivity as part of their psychological underpinnings, it is not unreasonable to suggest that impulsivity might also underlie opposite-sex aggression. Although evolutionary accounts of sex differences in aggression focus primarily on same-sex aggression, the mechanism purported to underlie the sex difference – whether a male ‘taste for risk’ or female fear – is relatively domain-general. This section briefly presents evidence that opposite-sex aggression is similar to same-sex aggression in its relationships to impulsivity and sociosexuality. The striking difference between the two forms of aggression is the pattern of the sex differences, which will be explored further in the following chapter.

Methods

This analysis is based on the data collected and described in the previous study (See Method section). The same list of 16 acts of direct aggression was used as for the same-sex aggression measure. Participants indicated how many times in the last 12 months they had done each of the 16 behaviours to someone of the opposite sex by choosing one of five categories, ranging from "never" to “more than 10 times”.

Additional participant information. No information on income or student status was recorded. However, relationship status was recorded as one of five categories: Single (437 women, 657 men), dating (117 women, 159 men), in a committed relationship, living apart (224 women, 285 men), co-habiting (376 women, 484 men), and married (330 women, 636 men). Participants who reported that they were single or dating (but did not report being in a committed relationship) were classed as unmated. Participants who reported being in a committed relationship, cohabiting, or married were classed as mated. Mated participants were significantly older than unmated participants ($F (1, 3704) = 209.11$, $p < .001$, mean difference 4.4 years, $d = 0.48$), significantly lower in risky impulsivity ($F (1, 3704) = 47.73$, $p < .001$, $d = 0.23$), and significantly lower in SOI ($F (1, 3704) = 22.52$, $p < .001$, $d = 0.16$). Although mated participants scored significantly higher on opposite-sex aggression ($F (1, 3704) = 6.70$, $p < .01$), the effect size was negligible ($d = .09$). Similarly, mated participants scored significantly lower on opposite-sex aggression ($F (1, 3704) = 4.01$, $p < .05$), but the difference was negligible.

Analysis of missing risky impulsivity data. Participants completed these questionnaires in conjunction with a larger study. They were therefore a subset of participants who completed a study on facial attractiveness, who answered questions on the SOI, risky impulsivity, same-sex aggression and opposite-sex aggression.

Because the risky impulsivity scale contains several driving items, which might make the scale less applicable to respondents who have no experience of driving, cases with missing data were examined to determine whether driving-related questions were more likely than non-driving related questions to be omitted. This was not the case ($\chi^2 (1) = 0.005$, n.s.). This suggests that the inclusion of items which are more relevant to drivers did not cause a disproportionate number of non-drivers to fail to complete the questionnaire.

Results

Same-sex aggression and opposite-sex aggression are very highly correlated. The correlation between the two measures is .65 for men and .74 for women. These values approximate the criterion for test-retest reliability for a single construct (Maltby, Day, & Macaskill, 2010), which suggests that same-sex aggression and opposite-sex aggression co-vary across individuals so strongly that they resemble a single measure.

Same-sex aggression and opposite-sex aggression are both related to risky impulsivity. The correlation between opposite-sex aggression and risky impulsivity is $r_{(2259)} = .32$, ($p < .001$) for men and $r_{(1512)} = .30$, ($p < .001$) for women. Using data from the previous study in this chapter for comparison, risky impulsivity is correlated less strongly with opposite-sex aggression than with same-sex aggression ($t_{(2260)} = 5.19$, $p < .001$) for men, while for women it is correlated more strongly with opposite-sex aggression than with same-sex aggression ($t_{(1513)} = 3.35$, $p < .001$). Male-male aggression, therefore, has the strongest relationship with risky impulsivity ($r_{(2259)} = .40$, $p < .001$) and female-female aggression the weakest ($r_{(1512)} = .25$, $p < .001$), while male-female and female-male aggression have a similar, intermediate strength of relationship with risky impulsivity.

Same-sex aggression and opposite-sex aggression both have the same relationship to sociosexuality. The correlation between opposite-sex aggression and sociosexuality is $r_{(2259)} = .19$, ($p < .001$) for men and $r_{(1512)} = .20$, ($p < .001$) for women. Same-sex and opposite-sex aggression are equally strongly correlated with sociosexuality (for women, $t_{(1513)} = 1.87$, n.s.; for men, $t_{(2260)} = 0.12$, n.s.).

Risky impulsivity is a common cause of opposite-sex aggression, same-sex aggression, and sociosexuality. Risky impulsivity was tested as a common cause of opposite-sex aggression, same-sex aggression, and sociosexuality, using the path model in Figure 2. When same-sex and opposite-sex aggression were only linked through risky impulsivity, this model was a poor fit to the data (men: χ^2/df =

340.83 RMSEA = .39, 90% CI [.37, .41], TLI = 0.55, CFI = 0.55; women: χ^2/df = 373.66 RMSEA = .50, 90% CI [.47, .52], TLI = -0.26, CFI = 0.37). Once same-sex aggression was allowed to be a cause of opposite-sex aggression, however, the model was a very good fit for both men (χ^2/df = 3.81, RMSEA = .035, 90% CI [.011, .063], TLI = 0.99, CFI = 1.00) and women (χ^2/df = 1.77, RMSEA = .023, 90% CI [.000, .060], TLI = .1.00, CFI = 1.00). This analysis therefore indicates that risky impulsivity is a common cause of all three of these forms of behaviour. However, the very strong correlation between same-sex and opposite-sex aggression means that they share more common variance than can be accounted for by risky impulsivity.

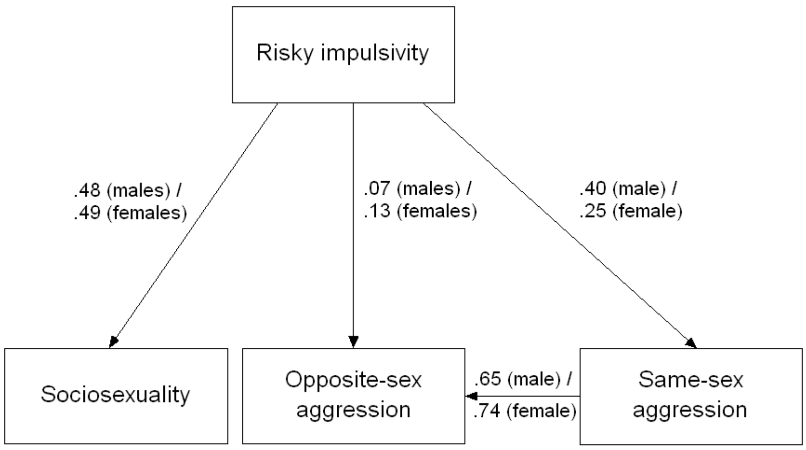

Figure 2. Relationship between risky impulsivity, same-sex aggression and opposite-sex aggression.

Both sexes show a sex-of-target shift. Men lower their aggression towards women, relative to their aggression towards other men, by more than two-thirds of a standard deviation (d = –.69). Women raise their aggression towards men by a smaller, though still appreciable, amount (d = .39).

Discussion

The present chapter has presented evidence that individual differences in same-sex aggression, opposite-sex aggression, and sociosexuality are all partly accounted for by individual differences in risky impulsivity. Though sex differences in these three forms of behaviour have different adaptive reasons, all three share an element of risk and can be thought of in terms of cost-benefit tradeoffs. This suggests that a general tendency to tolerate risk underlies sex differences in all three of these forms of behaviour. Although path analysis did not provide strong evidence for risky impulsivity as a mediator of sex differences in aggression and sociosexuality, risky impulsivity is a common cause of these behaviours and does account for significant within-sex variation. The absence of highly dangerous behaviours from the risky impulsivity scale might mean that it does not reflect the true magnitude of the differences between the sexes in risky behaviour.

Given that same-sex and opposite-sex aggression are so strongly interconnected, and that they are both positively related to risky impulsivity which shows a reliable sex difference in the male direction, it is puzzling that the sex differences in same-sex and opposite-sex aggression should reverse so dramatically and reliably (Archer, 2004). Any account of this reversal must explain two different effects: the relative inhibition of men's aggression towards women and the relative disinhibition of women's aggression towards men. The present replication of the target shift in a large adult sample enables measurement of the extent to which each sex alters their aggression according to the sex of the target. Men lower their aggression towards women (relative to their aggression towards men) to a greater extent than women raise their aggression towards men (relative to their aggression towards women).

Because the present data do not specify any relationship between target and actor, any inferences must be made with caution. Most work on opposite-sex aggression focuses exclusively on intimate partner aggression, but it has not yet been established whether aggression towards intimate partners differs from aggression towards same-sex targets because the sex of the target is different, or because of the intimacy of the relationship. The following chapter, therefore, builds on the current one by examining same-sex and opposite-sex aggression as a function of the relationship between actor and target, in order to examine separately the effects of target sex and intimacy on aggression.

References

Anderson, C. A., Buckley, K. E., & Carnagey, N. L. (2008). Creating your own hostile environment: A laboratory examination of trait aggressiveness and the violence escalation cycle. *Personality and Social Psychology Bulletin, 34*, 462-473. 10.1177/0146167207311282.

Archer, J. (2004). Sex differences in aggression in real-world settings: A meta-analytic review. *Review of General Psychology, 8*, 291-322. doi:10.1037/1089-2680.8.4.291.

Archer, J. (2009). Does sexual selection explain human sex differences in aggression? *Behavioral and Brain Sciences, 32*, 249-310. 10.1017/s0140525x09990951.

Archer, J., & Coyne, S. M. (2005). An integrated review of indirect, relational, and social aggression. *Personality and Social Psychology Review, 9*, 212-230. doi:10.1207/s15327957pspr0903_2.

Archer, J., & Mehdikhani, M. (2003). Variability among males in sexually selected attributes. *Review of General Psychology, 7*, 219-236. 10.1037/1089-2680.7.3.219.

Berkowitz, L. (1989). Frustration aggression hypothesis: Examination and reformulation *Psychological Bulletin, 106*, 59-73. doi:10.1037/0033-2909.106.1.59.

Bettencourt, B. A., & Miller, N. (1996). Gender differences in aggression as a function of provocation: A meta-analysis. *Psychological Bulletin, 119*, 422-447. doi:10.1037/0033-2909.119.3.422.

Bjorklund, D. F., & Kipp, K. (1996). Parental investment theory and gender differences in the evolution of inhibition mechanisms. *Psychological Bulletin, 120*, 163-188. doi:10.1037/0033-2909.120.2.163.

Boothroyd, L. G., Cross, C. P., Gray, A. W., Coombes, C., & Gregson-Curtis, K. (2011). Perceiving the facial correlates of sociosexuality: Further evidence. *Personality and Individual Differences, 50*, 422-425.

Brown, G. R., Laland, K. N., & Mulder, M. B. (2009). Bateman's principles and human sex roles. *Trends in Ecology & Evolution, 24*, 297-304. 10.1016/j.tree.2009.02.005.

Buller, D. (2005). *Adapting minds: Evolutionary psychology and the persistent quest for human nature*. Cambridge, MA: MIT Press.

Buss, A. H. (1961). *The Psychology of Aggression*. New York: Wiley. doi:10.1037/11160-000.

Buss, D. M. (1989). Sex differences in human mate preferences: Evolutionary hypotheses tested in 37 cultures. *Behavioral and Brain Sciences, 12*, 1-14. doi:10.1017/S0140525X00023992.

Campbell, A. (1995). A few good men: Evolutionary psychology and female adolescent aggression. *Ethology and Sociobiology, 16*, 99-123. doi:10.1016/0162-3095(94)00072-F.

Campbell, A. (1999). Staying alive: Evolution, culture, and women's intrasexual aggression. *Behavioral and Brain Sciences, 22*, 203-214+. doi:10.1017/S0140525X99001818.

Campbell, A. (2002). *A mind of her own: The evolutionary psychology of women*. Oxford: Oxford University Press.

Campbell, A. (2006). Sex differences in direct aggression: What are the psychological mediators? *Aggression and Violent Behavior, 11*, 237-264. doi:10.1016/j.avb.2005.09.002.

Campbell, A. (2008). The morning after the night before: Affective reactions to one-night stands among mated and unmated women and men. *Human Nature: An Interdisciplinary Biosocial Perspective, 19*, 157-173. doi:10.1007/s12110-008-9036-2.

Campbell, A., & Muncer, S. (2008). Intent to harm or injure? Gender and the expression of anger. *Aggressive Behavior, 34*, 282-293. 10.1002/ab.20228.

Campbell, A., & Muncer, S. (2009). Can 'risky' impulsivity explain sex differences in aggression? *Personality and Individual Differences, 47*, 402-406. 10.1016/j.paid.2009.04.006.

Campbell, A., Muncer, S., & Bibel, D. (2001). Women and crime - An evolutionary approach. *Aggression and Violent Behavior, 6*, 481-497. 10.1016/S1359-1789(00)00019-7.

Card, N. A., Stucky, B. D., Sawalani, G. M., & Little, T. D. (2008). Direct and indirect aggression during childhood and adolescence: A meta-analytic review of gender differences, intercorrelations, and relations to maladjustment. *Child Development, 79*, 1185-1229. doi:10.1111/j.1467-8624.2008.01184.x.

Carver, C. S., & Harmon-Jones, E. (2009). Anger Is an Approach-Related Affect: Evidence and Implications. *Psychological Bulletin, 135*, 183-204. 10.1037/a0013965.

Clark, R. D., & Hatfield, E. (1989). Gender differences in receptivity to sexual offers. *Journal of Psychology and Human Sexuality, 2*, 39-55. doi:10.1300/J056v02n01_04.

Corbett, C. (2007). Vehicle-related crime and the gender gap. *Psychology, Crime & Law, 13*, 245 - 263. 10.1080/10683160600822022.

Cross, C. P., Tee, W., & Campbell, A. (2011). Gender symmetry in intimate aggression: An effect of intimacy or target sex? *Aggressive Behavior*, First published online: 22 Feb 2011. doi: 10.1002/ab.20388.

Daly, M., & Wilson, M. (1988). *Homicide*. New York: Aldine de Gruyter.

Degenhardt, L., Chiu, W. T., Sampson, N., Kessler, R. C., Anthony, J. C., Angermeyer, M., et al. (2008). Toward a global view of alcohol, tobacco, cannabis, and cocaine use: Findings from the WHO World Mental Health Surveys. *Plos Medicine, 5*, 1053-1067. 10.1371/journal.pmed.0050141.

Devincenzi, I., Ancellepark, R. A., Brunet, J. B., Costigliola, P., Ricchi, E., Chiodo, F., et al. (1992). Comparison of female to male and male to female transmission of HIV in 563 stable couples. *British Medical Journal, 304*, 809-813. doi:10.1136/bmj.304.6830.809.

Duncan, N. (1999). *Sexual bullying: Gender conflict and pupil culture in secondary schools*. London: Routledge.

Felson, R. B. (1982). Impression Management and the Escalation of Aggression and Violence. *Social Psychology Quarterly, 45*, 245-254. doi:10.2307/3033920.

Franklin, C. A. (2010). Physically forced, alcohol-induced, and verbally coerced sexual victimization: Assessing risk factors among university women. *Journal of Criminal Justice, 38*, 149-159. 10.1016/j.jcrimjus.2010.02.004.

Gangestad, S. W., & Simpson, J. A. (1990). Toward an evolutionary history of female sociosexual variation. *Journal of Personality, 58*, 69-96. doi:10.1111/j.1467-6494.1990.tb00908.x.

Garcia-Forero, C., Gallardo-Pujol, D., Maydeu-Olivares, A., & Andres-Pueyo, A. (2009). Disentangling impulsiveness, aggressiveness and impulsive aggression: An empirical approach using self-report measures. *Psychiatry Res, 168*, 40-49. doi:10.1016/j.psychres.2008.04.002.

Gergen, M. (1990). Beyond the evil empire: Horseplay and aggression. *Aggressive Behavior, 16*, 381-398.

Gomendio, M., Harcourt, A. H., & Roldán, E. R. S. (1998). Sperm competition in mammals. In T. R. Birkhead & A. P. Møller (Eds.), *Sperm competition and sexual selection* (pp. 667-756). San Diego: Academic Press.

Gottfredson, M. R., & Hirschi, T. (1990). *A general theory of crime*. Stanford, CA: Stanford University Press.

Harris, M. B. (1992). Sex, race, and experiences of aggression. *Aggressive Behavior, 18*, 201-217.

Henry, B., Caspi, A., Moffitt, T. E., & Silva, P. A. (1996). Temperamental and familial predictors of violent and nonviolent criminal convictions: Age 3 to age 18. *Developmental Psychology, 32*, 614-623. 10.1037/0012-1649.32.4.614.

Herold, E. S., & Mewhinney, D. M. K. (1993). Gender differences in casual sex and aids prevention: A survey of dating bars. *Journal of Sex Research, 30*, 36-42. doi:10.1080/00224499309551676.

Hoyle, R. H., Fejfar, M. C., & Miller, J. D. (2000). Personality and sexual risk taking: A quantitative review. *Journal of Personality, 68*, 1203-1231. doi:10.1111/1467-6494.00132.

Ireland, J. L., & Archer, J. (2008). Impulsivity among adult prisoners: A confirmatory factor analysis study of the Barratt Impulsivity Scale. *Personality and Individual Differences, 45*, 286-292. 10.1016/j.paid.2008.04.012.

Jokela, M., Rotkirch, A., Rickard, I. J., Pettay, J., & Lummaac, V. (2010). Serial monogamy increases reproductive success in men but not in women. *Behavioral Ecology, 21*, 906-912. doi:10.1093/beheco/arq078.

Jonason, P. (2007). A mediation hypothesis to account for the sex difference in reported number of sexual partners: An intrasexual competition approach. *International Journal of Sexual Health, 19*, 41-49. 10.1300/J514v19n04_05.

Jonason, P., & Fisher, T. (2009). The power of prestige: Why young men report having more sex partners than young women. *Sex Roles, 60*, 151-159. 10.1007/s11199-008-9506-3.

Kochanska, G., & Knaack, A. (2003). Effortful control as a personality characteristic of young children: Antecedents, correlates, and consequences. *Journal of Personality, 71*, 1087-1112.

Koss, M. P., & Dinero, T. E. (1989). Discriminant analysis of risk factors for sexual victimization among a national sample of college women. *Journal of Consulting and Clinical Psychology, 57*, 242-250. doi:10.1037/0022-006X.57.2.242.

Lees, S. (1993). *Sugar and spice: Sexuality and adolescent girls* London: Penguin.

Maltby, J., Day, L., & Macaskill, A. (2010). *Personality, individual differences, and intelligence* (2nd ed.). Harlow, England: Person Education Ltd.

Moffitt, T. E., Krueger, R. F., Caspi, A., & Fagan, J. (2000). Partner abuse and general crime: How are they the same? How are they different? *Criminology, 38*, 199-232. doi:10.1111/j.1745-9125.2000.tb00888.x.

Mulder, M. B., & Rauch, K. L. (2009). Sexual conflict in humans: Variations and solutions. *Evolutionary Anthropology, 18*, 201-214. 10.1002/evan.20226.

Murray, D. M. (2003). *Living on the edge: Sensation seeking and extreme sports participation.* Doctoral thesis, University of Connecticut, Connecticut.

Oliver, M. B., & Hyde, J. S. (1993). Gender differences in sexuality: A meta-analysis. *Psychological Bulletin, 114*, 29-51. doi:10.1037/0033-2909.114.1.29.

Ostovich, J. M., & Sabini, J. (2004). How are sociosexuality, sex drive, and lifetime number of sexual partners related? *Personality and Social Psychology Bulletin, 30*, 1255-1266. doi:10.1177/0146167204264754.

Pampel, F. C. (2001). Gender equality and the sex differential in mortality from accidents in high income nations. *Population Research and Policy Review, 20*, 397-421.

Patton, J. H., Stanford, M. S., & Barratt, E. S. (1995). Factor structure of the Barratt Impulsiveness Scale. *Journal of Clinical Psychology, 51*, 768-774. doi:10.1002/1097-4679(199511)51:6<768::AID-JCLP2270510607>3.0.CO;2-1.

Penke, L., & Asendorpf, J. B. (2008). Beyond global sociosexual orientations: A more differentiated look at sociosexuality and its effects on courtship and romantic relationships. *Journal of Personality and Social Psychology, 95*, 1113-1135. 10.1037/0022-3514.95.5.1113.

Penn, D. J., & Smith, K. R. (2007). Differential fitness costs of reproduction between the sexes. *Proceedings of the National Academy of Sciences of the United States of America, 104*, 553-558. 10.1073/pnas.0609301103.

Pérusse, D. (1993). Cultural and reproductive success in industrial societies: Testing the relationship at the proximate and ultimate levels. *Behavioral and Brain Sciences, 16*, 267-322. doi:10.1017/S0140525X00029939.

Petersen, J. L., & Hyde, J. S. (2010). A meta-analytic review of research on gender differences in sexuality, 1993-2007. *Psychological Bulletin, 136*, 21-38. 10.1037/a0017504.

Ramirez, J. M., & Andreu, J. M. (2006). Aggression, and some related psychological constructs (anger, hostility, and impulsivity): Some comments from a research project. *Neuroscience and Biobehavioral Reviews, 30*, 276-291. doi:10.1016/j.neubiorev.2005.04.015.

Richardson, D. R., & Green, L. R. (1999). Social sanction and threat explanations of gender effects on direct and indirect aggression. *Aggressive Behavior, 25*, 425-434. doi:10.1002/(SICI)1098-2337(1999)25:6<425::AID-AB3>3.0.CO;2-W.

Ripa, C. P. L., Hansen, H. S., Mortensen, E. L., Sanders, S. A., & Reinisch, J. M. (2001). A Danish version of the Sensation Seeking Scale and its relation to a broad spectrum of behavioral and psychological characteristics. *Personality and Individual Differences, 30*, 1371-1386. doi:10.1016/S0191-8869(00)00119-7.

Roe, S., Coleman, K., & Kaiza, P. (2009). Violent and sexual crime. In A. Walker, J. Flatley, C. Kershaw & D. Moon (Eds.), *Crime in England and Wales 2008/09* (pp. 43-72): Home Office Statistical Bulletin 11/09. London: Home Office.

Schmitt, D. P. (2003). Universal sex differences in the desire for sexual variety: Tests from 52 nations, 6 continents, and 13 islands. *Journal of Personality and Social Psychology, 85*, 85-104. doi:10.1037/0022-3514.85.1.85.

Schmitt, D. P. (2004). The Big Five related to risky sexual behaviour across 10 world regions: Differential personality associations of sexual promiscuity and relationship infidelity. *European Journal of Personality, 18*, 301-319. 10.1002/per.520.

Schmitt, D. P. (2005a). Measuring sociosexuality across people and nations: Revisiting the strengths and weaknesses of cross-cultural sex research. *Behavioral and Brain Sciences, 28*, 297-311.

Schmitt, D. P. (2005b). Sociosexuality from Argentina to Zimbabwe: A 48-nation study of sex, culture, and strategies of human mating. *Behavioral and Brain Sciences, 28*, 247-+. doi:10.1017/S0140525X05000051.

Schmitt, D. P., & Shackelford, T. K. (2008). Big Five Traits Related to Short-Term Mating: From Personality to Promiscuity across 46 Nations. *Evolutionary Psychology, 6*, 246-282.

Schmitt, D. P., Shackelford, T. K., & Buss, D. M. (2001). Are men really more 'oriented' toward short-term mating than women? A critical review of theory and research. *Psychology, Evolution and Gender, 3*, 19. doi:10.1080/14616660110119331.

Seal, D. W., & Agostinelli, G. (1994). Individual differences associated with high-risk sexual behaviour: Implications for intervention programs. *Aids Care: Psychological and Socio-Medical Aspects of AIDS/HIV, 6*, 393-397. doi:10.1080/09540129408258653.

Sear, R., & Mace, R. (2008). Who keeps children alive? A review of the effects of kin on child survival. *Evolution and Human Behavior, 29*, 1-18.

Simpson, J. A., & Gangestad, S. W. (1991). Individual differences in sociosexuality: evidence for convergent and discriminant validity. *Journal of Personality and Social Psychology, 60*, 870-883. doi:10.1037/0022-3514.60.6.870.

Smith, P., & Waterman, M. (2006). Self-reported aggression and impulsivity in forensic and non-forensic populations: The role of gender and experience. *Journal of Family Violence, 21*, 425-437. doi:10.1007/s10896-006-9039-x.

Smits, D. J. M., & Kuppens, P. (2005). The relations between anger, coping with anger, and aggression, and the BIS/BAS system. *Personality and Individual Differences, 39*, 783-793. doi:10.1016/j.paid.2005.02.023.

Strüber, D., Luck, M., & Roth, G. (2008). Sex, aggression and impulse control: An integrative account. *Neurocase, 14*, 93-121. 10.1080/13554790801992743.

Symons, D. (1979). *The evolution of human sexuality*. New York: Oxford University Press.

Trivers, R. (1972). Parental investment and sexual selection. In B. Campbell (Ed.), *Sexual selection and the descent of man*: Aldine de Gruyter.

Vigil-Colet, A., Morales-Vives, F., & Tous, J. (2008). The Relationships between functional and dysfunctional impulsivity and aggression across different samples. *Spanish Journal of Psychology, 11*, 480-487.

Vigil, J. M. (2009). A socio-relational framework of sex differences in the expression of emotion. *Behavioral and Brain Sciences, 32*, 375-390. 10.1017/s0140525x09991075.

Wang, X. T. (2002). Risk as reproductive variance. *Evolution and Human Behavior, 23*, 35-57. doi:10.1016/S1090-5138(01)00091-5.

Wilson, M., & Daly, M. (1985). Competitiveness, risk taking, and violence: The young male syndrome. *Ethology and Sociobiology, 6*, 59-73. doi:10.1016/0162-3095(85)90041-X.

Zuckerman, M., & Kuhlman, D. M. (2000). Personality and risk-taking: common biosocial factors. *Journal of Personality, 68*, 999-1029. doi:10.1111/1467-6494.00124.

CHAPTER FOUR

The Target Paradox: An Effect of Sex or Intimacy?

The ‘target paradox’ refers to the observation that, although male intrasexual aggression is consistently higher than female intrasexual aggression, in intimate partnerships women aggress towards their partners just as often as men do, if not more so (Archer, 2000a). Results from the previous chapter suggest that men lower their aggression towards opposite sex targets while women raise theirs. However, it could not be determined whether men lower their aggression towards all opposite sex targets, nor whether women raise their aggression towards all opposite-sex targets. It remains unclear whether the target paradox is the result of the sex of the target, intimacy with the target, or both. The present chapter examines separately the effects on aggression of the target’s sex and the level of intimacy between actor and target.

Intimate Partner Aggression and Intimate Partner Violence

Aggression, as noted in the Introduction, is defined in part by actions and is operationalised in terms of acts. In contrast, violence is defined chiefly by its effects on its victims. It is important to distinguish between these two terms and not to treat them as interchangeable, particularly in the case of partner aggression, which is discussed below (Archer, 1994, 2000b). To illustrate the difference between aggression and violence, consider the following two scenarios. In the first, a man and a woman are arguing when, in response to a verbal insult, she punches him in the face; this is painful, but does not cause a bruise. In the second, a man and a woman are arguing when, in response to a verbal insult, he punches her in the face; this results in a fractured cheekbone, a visit to hospital, and a lengthy period of recovery.

In terms of aggression, as operationalised by act-based measures, these exchanges are the same because the acts are the same. In terms of violence, however, the latter exchange is more violent because the consequences are more severe.

Although analyses of acts (Archer, 2000a) tend to show gender symmetry or small sex differences depending on the kind of act (d = -0.24 to d = 0.13; Archer, 2002), the majority of victims are women when the variable of interest is injury (Archer, 2000a; R. P. Dobash, Dobash, Wilson, & Daly, 1992; Straus, Gelles, & Steinmetz, 1988) or death (Wilson & Daly, 1992). Unfortunately these two observations, although logically perfectly compatible, are taken as contradictory by some. The terms violence and aggression are often used interchangeably (Archer, 1994), which leads to confusion: Findings that men and women report similar rates of aggressive acts have been interpreted by some authors (e.g. R. P. Dobash et al., 1992; White, Smith, Koss, & Figueredo, 2000) as a claim that they are "equally violent". The use of act-based measures of aggression, despite evidence of reliability and validity (Archer, 1999), has been criticised because the same act might have more severe consequences when perpetrated by a male as opposed to a female partner – according to this argument, the use of act-based measures obscures 'real' sex differences (R. P. Dobash et al., 1992).

The question of whether it is appropriate to focus on acts or consequences in any given study depends on the aims of the research. Researchers examining the physical and psychological consequences of aggressive behaviour benefit from a violence-orientated perspective. When the aim is to elucidate proximate mechanisms leading to aggression, measuring the consequences of aggressive acts is not necessary because the acts themselves are the outcome. Since the focus of this thesis is on the proximate mechanisms and intrapsychic states leading to aggression, rather than the consequences of aggressive acts, act-based rather than consequence-based measures are used throughout.

Evolutionary Approaches to Intimate Partner Aggression

Most evolutionary approaches to intimate partner aggression construe it as a form of control over sexual access, primarily used by men to control the reproductive careers of their female partners (see, e.g. Goetz, Shackelford, Romero, Kaighobadi, & Miner, 2008; Kaighobadi, Shackelford, & Goetz, 2009; Wilson & Daly, 1993). The argument runs as follows. Male violence towards female partners is a consequence of paternity uncertainty: By restricting a female partner's behaviour and preventing cuckoldry, a man avoids investing in offspring who are not his own. Because maternity is not subject to the same doubts as paternity, women do not need to control the sexual behaviour of their partner in order to avoid being deceived into investing in non-related offspring. Hence, intimate partner aggression is adaptive specifically for males.

However, as noted in the preceding section, acts of intimate partner aggression are committed by women as often as they are by men. Other researchers working in evolutionary psychology have argued that both male and female partners have a considerable amount to lose by the desertion of a mate: Males stand to lose sexual access or be cuckolded, but women stand to lose their partner's investment in the form of time or material resources – which in a population with extensive biparental care might amount to a great deal. Thus, although the reason for the motivation to deter infidelity or desertion may differ between the sexes, the stakes are high for both sexes when there is conflict between partners (Buss, Larsen, Westen, & Semmelroth, 1992). Although men and women use different coping strategies in response to an infidelity (Miller & Maner, 2008), jealousy exists and is strong in both sexes (Grice & Seely, 2000; Harris, 2003). Women respond to betrayals with just as much (Haden & Hojjat, 2006) if not more (de Weerth & Kalma, 1993) physical aggression than men, and men are not disproportionately likely to kill partners because of jealousy (Harris, 2003).

When the possible causes of women's relationship aggression are examined, it does not appear to be that case that women's intimate partner aggression is motivated solely by fear or self-defence. Fear for physical safety is negatively correlated with women's aggression towards partners, whereas we would expect it to be positively correlated with aggression if self-defence were the primary motivation (Graham-Kevan & Archer, 2005). Although self-defence might well be a motivation for female partner aggression in some cases, retaliation for physical or emotional hurt is also frequently given by women as a reason for their aggression (Hettrich & O'Leary, 2007). Furthermore, controlling behaviour predicts use of physical aggression in women (Graham-Kevan & Archer, 2005) as well as in men (Graham-Kevan & Archer, 2008), which suggests that both men and women use physical aggression as a means of controlling their partners' behaviour (Felson & Outlaw, 2007). Intimate partner aggression might therefore be best construed as a response to conflict which is used by both sexes.

Recently, Campbell (2008, 2010) has suggested that women's aggression towards intimate partners might be a by-product of the fear-reducing properties of the hormone oxytocin. As outlined in the Introduction, women have more to fear from a new sexual partnership than men do: Oxytocin might therefore be the mechanism by which an adaptive fear of male conspecifics is over-ridden with respect specifically to an intimate partner. This person-specific reduction in fear might result in an increase in women's aggression towards intimate partners, relative to other male targets.

The Present Paper

An effect of sex or intimacy? One of the problems in studying intimate partner aggression is that it is not immediately clear to what it should be compared in terms of prevalence: Comparing intimate partner aggression with same-sex aggression (e.g. Archer & Webb, 2006) confounds the effects of intimacy and of the sex of the target because all of the opposite-sex targets are intimates while the same-sex targets might be family, friends, or strangers. Comparing intimate partner aggression with aggression towards strangers of unspecified sex (e.g. Felson, Ackerman, & Yeon, 2003) confounds the effects of intimacy and of the sex of the target because all of the intimate targets are opposite-sex while the strangers might be of either sex. The present paper therefore sought to disentangle the effects of sex and intimacy.

Measurement of aggression. Another issue in comparing intimate partner aggression to same-sex aggression is as follows: Not only do the targets differ in both their sex and their relationship to the aggressor but the interactions between aggressor and target will also differ. For example, as alluded to in Chapter Three, the sex of the individuals in a dyad will influence the types of anger expression that are most likely to be used. Furthermore, the most salient kinds of provocation in intimate partnerships differ from those in a close friendship: Because romantic relationships generally have a norm or expectation of sexual exclusivity, most research on betrayal in such relationships has focused on sexual infidelity (Shackelford & Buss, 1996). Conversely, there is no such exclusivity norm in close friendship, and research on betrayal in friendships generally focuses on the betrayal of confidence – failure to keep a secret, for example (e.g. Feldman, Cauffman, Jensen, & Arnett, 2000). Self-report data on aggressive episodes might therefore differ between targets as a function of the type of provocation or the number of opportunities to aggress (Felson et al., 2003).

Situational factors, such as the type and degree of provocation experienced, can be controlled by the use of vignette scenarios; one study which has done this is Haden and Hojjat's (2006), in which self-reported aggression in response to actual and hypothetical betrayals was measured. In this study, no sex differences were found in aggressive responding, nor was there a difference in aggression towards friends as opposed to partners. However, it is not reported whether same-sex or opposite-sex friends were considered, which means that intimacy is confounded with sex. Furthermore, relationship type was a between-participants variable, which means that the shift between partners and friends cannot be directly examined. The present study therefore used vignette scenarios alongside self-report data, with target as a within-participants variable, in order to provide convergent evidence on the effects of target sex and intimacy. The paper itself presents the data from the vignettes, while the self-report data are presented later in the chapter as a supplementary analysis.

Gender Symmetry in Intimate Aggression: An Effect of Intimacy or Target Sex?

Catharine P. Cross, William Tee, Anne Campbell

Durham University

Aggressive Behavior

First published online: 22 Feb 2011, doi: 10.1002/ab.20388

Abstract

Men's greater use of direct aggression is not evident in studies of intimate partner aggression. In previous research the effects of target sex and relationship intimacy have frequently been confounded: The present study sought to examine these effects separately. One hundred and seventy-four undergraduates (59 male and 115 female) read vignette scenarios in which they were provoked by a same-sex best friend, an opposite-sex best friend, and a partner. For each target, participants estimated their likely use of direct physical and verbal aggression as well as non-injurious forms of anger expression. Results showed that men lower their aggression in the context of an intimate partnership and that this is an effect of the target's sex. In contrast, women raise their aggression in the context of an intimate partnership and this is an effect of intimacy with the target. The use of non-injurious angry behaviour did not vary between targets for either sex of participant, which suggests that the effects of target are confined to behaviours which carry an intention to harm.

Possible effects of social norms and oxytocin-mediated emotional disinhibition on intimate partner aggression are discussed.

In most circumstances, men engage in direct aggression – in which the aggressor can be identified and counter-attacked by the target – to a greater extent than women. While this sex difference in aggression is robust and marked, it disappears or even reverses within the context of a dating or marital relationship (Archer, 2000a; Milardo, 1998; Moffitt, Krueger, Caspi, & Fagan, 2000; Straus & Ramirez, 2007; Thornton, Graham-Kevan, & Archer, 2010). This ‘target paradox’ raises three important questions. First, whether men are lowering their levels of aggression when the target is an intimate partner, whether women are raising their levels of aggression, or whether both of these things are happening. Second, whether the rate of aggression towards intimate partners is a function of the sex of the target, the intimacy of the relationship, or both. Third, whether forms of anger expression other than direct aggression also show a target shift.

The Target Paradox: Male and Female Shifts

One possible explanation for the target paradox in direct aggression is that men lower their levels of aggression when the target is an intimate partner. There is evidence that men are more inhibited about striking partners than same-sex others (Archer, Parveen, & Webb, 2010; Felson et al., 2003). Given that attacking a woman is less dangerous in terms of the likelihood and possible severity of retaliation, it seems that the most likely candidate to explain this pattern is a norm of ‘chivalry’ which proscribes aggression towards women (Felson, 2002; Felson & Feld, 2009). Despite claims that the abuse of women by men is tolerated and even encouraged by a patriarchal society (R. E. Dobash & Dobash, 1979), the general public see aggression directed at women by men as more reprehensible (Davidovic, Bell, Ferguson, Gorski, & Campbell, 2010) and more deserving of police intervention or criminal action (Felson & Feld, 2009; Sorenson & Taylor, 2005) than aggression directed at men by women. This normative prohibition holds true for aggression towards women who are partners (Feld & Felson, 2008; Sorenson & Taylor, 2005), acquaintances (Feld & Felson, 2008; Felson & Feld, 2009), or strangers (Golin & Romanowski, 1977; S. P. Taylor & Epstein, 1967). This suggests that men's lowered aggression within the context of a romantic relationship is not because the target is a romantic partner but simply because the target is female.

A second possible cause of the target paradox is that women raise their levels of aggression when the target is an intimate partner. There is some evidence that women are more likely to use physical aggression against a male partner than towards a same-sex other (Archer et al., 2010; Hilton, Harris, & Rice, 2000; Tee, 2007). This is somewhat counterintuitive given that males are more able than females to retaliate in a way that would cause injury. Campbell (2008, 2010) argues that while women's aggression is usually lower than men's due to their greater levels of fear, the raised levels of oxytocin that characterise a pair-bonded relationship result in reduced levels of fear and increased trust. These reduce the perceived threat of retaliation and facilitate direct aggression. This means that we should expect to see women's aggression raised towards partners, but not other men.

Sex Differences in Non-Injurious Anger Expression

The robust sex difference in direct aggression exists – except within intimate partnerships – despite the absence of sex differences in anger (Archer, 2004). Sex differences in direct aggression might, therefore, be partly the result of sex differences in the use of behaviours which are motivated by anger but are not direct aggression. Such behaviours have been categorised in a number of different ways (Tangney et al., 1996), the most recent being Campbell and Muncer's (2008) classification of non-injurious angry behaviours into explosive or defusing types. Both types are performed in the absence of a target person. Explosive angry behaviours are characterised by a discharge of anger which occurs at a high level of arousal. An example might be smashing objects or shouting abuse when alone. Such acts have sometimes been classified as 'displaced aggression' (Archer, 2004), although Campbell and Muncer (2008) argue that such acts do not constitute aggression owing to the absence of an intention to cause harm or injury. Defusing angry behaviours are those which serve the function of reducing the level of anger, for example by withdrawing from the source of provocation or by talking about the angry feelings with a third party.

Campbell and Muncer (2008) suggested that women's lower levels of direct aggression might be related to their greater use of defusing angry behaviour. Consistent with this, defusing angry behaviour is negatively correlated with direct aggression and women report significantly higher use of defusing angry behaviour than men. Conversely, explosive angry behaviour is positively correlated with direct aggression and is significantly more frequent in men (Campbell & Muncer, 2008). At a proximate level, the sex differences in explosive and defusing angry behaviour might be the result of women's greater feelings of distress and shame in response to angry episodes (Kring, 2000). These might lead women to cry or to seek emotional support when angry, while a louder and more expansive expression of anger comes more naturally to men even in private. At a more distal level, sex-specific selection pressures might have led to sex differences in emotion expression (Vigil, 2009): Men form more unstable alliances with each other and have stronger dominance hierarchies; hence men's emotion expression is geared towards signalling capacity and prompting conspecifics to avoid them when experiencing negative affect. Women form less hierarchical and more intimate non-kin relationships; hence their emotion displays are geared towards signalling trustworthiness and eliciting support (S. E. Taylor et al., 2000; Vigil, 2009).

Because explosive and defusing angry behaviours are not aggression but anger expression, we might expect the sex differences therein to remain robust in the context of intimate partnerships: They do not carry an intention to harm, so their legitimacy is not sensitive to target sex. Furthermore, because they are not directed at a target, as aggressive acts are, they do not entail a risk of retaliation. We therefore suggest that effects of target sex and intimacy will be confined to direct aggression and not eliminate sex differences in explosive and defusing angry behaviours.

Building on Previous Research

One of the problems in developing an account of the target paradox in direct aggression is that it is not clear to which other targets intimate partners should be compared. Many studies of sex differences in aggression specifically refer to same-sex others and, in studies where the sex of the target is not specified, response patterns seem to suggest that respondents have a same-sex other in mind (Archer, 2004). In studies which compare partner aggression with levels of same-sex aggression, there is usually a confound between sex of target and intimacy, as Felson and Feld (2009) note. Same-sex others might be close friends, strangers, or anything in between. If men's lowered intimate aggression is a result of target sex while women's raised aggression is the result of intimacy, comparisons between intimate partners and same-sex others might be picking up different effects in the two sexes. The picture is further complicated by the fact that the most likely kind of same-sex target differs for men and women. For example, male-male aggression is more likely to take place between strangers than friends, while female-female aggression takes place between close friends and strangers with a similar frequency (Hilton et al., 2000).

Richardson and Green (2006) conducted a study in which respondents reported the actual frequency of aggression towards partners, same-sex friends, and opposite-sex friends, thus allowing the effects of sex and intimacy to be examined. Direct aggression towards a partner was found to be more frequent than direct aggression towards a friend of either sex, but no effect of respondent sex (or interaction between sex and target) was found. However, an important limitation of the self-report data in this case is that the rate of conflicts between same-sex and opposite-sex friends is likely to differ: Most close friendships are formed between people of the same sex (Rose, 1985). Furthermore, the type and degree of provocation experienced with regard to different real-life targets is likely to differ, which means that target may be confounded with provocation.

One approach to overcoming these problems has been to compare aggression towards partners and close friends in vignette scenarios. In studies using vignettes, participants read a short paragraph describing a hypothetical situation, and are asked to state how they believe they would feel or behave. The response format may be a forced choice (e.g. O'Connor, Archer, & Wu, 2001), or likelihood ratings for a range of different behaviours (e.g. Tremblay & Ewart, 2005). One benefit of using hypothetical scenarios is that provocation can be held constant across different targets, which can be specified by the researcher. A vignette study by Haden and Hojjat (2006) examined aggressive responses to betrayal. Young adult respondents were asked how they would respond to betrayal by either a friend of the same sex or a partner. No sex differences emerged in either condition. However, respondents were not asked about responses to betrayal by a friend of the opposite sex. Type of relationship was therefore confounded with the sex of the target.

The present study builds on a study conducted by Tee (2007) which ran as follows. A list of situations in which an individual might be let down by a friend or partner was generated by undergraduates. Three situations were selected from that list on the basis of their salience to students. One scenario involved the target promising to hand in a piece of academic work on the participant's behalf, then failing to do so; the second involved the target telling people a personal secret about the participant which they had promised not to do; while the third involved the participant calling unexpectedly into their partner's house to find them in bed with the participant's best friend. Undergraduate participants were asked to imagine a hypothetical same-sex best friend whom they had known for three years, and a hypothetical partner they had known for an equal length of time, and to report how likely they would be to use different forms of angry behaviour towards those two targets in each of the hypothetical scenarios.

The self-reported likelihood of angry behaviour in these scenarios was strongly correlated with actual self-reported angry behaviour over the previous two years, indicating that these vignettes were an effective assay of individual differences in the tendency to respond to provocation with aggression. The scenario involving a personal secret elicited greater aggression than the work-related scenario. Previous work suggests that betrayal of confidence by friends is taken very seriously by college students (Feldman et al., 2000) and is more anger-provoking than negligence or rebuff when perpetrated by a partner (Fehr, Baldwin, Collins, Patterson, & Benditt, 1999). The close personal nature of betraying a secret might therefore make this scenario more provoking than the failure to fulfil a promised favour.

The sexual infidelity scenario elicited the greatest aggression. This is consistent with the results of Haden and Hojjat (2006), who found that sexual infidelity elicited greater aggression in hypothetical scenarios than lying did. However, this scenario was not used in the present study because finding a same-sex friend in bed with one's partner and finding an opposite-sex friend in bed with one's partner are not equivalent: Not only is the latter situation arguably less plausible in heterosexual relationships, but it also implies that the partner lied about his or her sexuality as well as being unfaithful, therefore violating two relationship norms (Finkel, Rusbult, Kumashiro, & Hannon, 2002) instead of one.

Tee's results suggested that women raised their levels of aggression towards a partner relative to a same-sex friend, while men did the opposite. As with other studies outlined here, however, it was not possible to examine the effects of sex and intimacy separately because there was a confound of target sex with nature of relationship.

Aims of the present study

The present study aims to build on the existing literature in order to advance our understanding of the target paradox. We use vignette scenarios to compare aggression towards partners, same-sex friends, and opposite-sex friends, holding provocation constant. This enables separate examination of the effect of relationship and the effect of the sex of the target. Each respondent is asked about each of the three targets, so the effects of changing the target can be directly observed within participants. Self-reported aggressive acts over the last two years are also recorded, in order to validate the data from the vignettes. A measure of anger is included to test whether the scenarios presented are considered more or less provoking depending on the sex of the respondent and target, and the relationship between them. As well as physical and verbal direct aggression, explosive and defusing angry behaviour are measured. This enables us to test whether the sex differences in explosive and defusing angry behaviour remain robust in intimate relationships.

We predict that women will score higher than men on aggression towards partners and opposite-sex friends, but men will score higher on aggression towards same-sex friends (following Archer, 2004). We expect men's aggression to be influenced mainly by target sex, and women's by intimacy with the target. This means that women's aggression will be higher towards partners than towards friends of either sex, while men's aggression will be lower towards women than towards men, regardless of whether the female target is a friend or a partner. We anticipate that men will score higher than women on explosive angry behaviour, while women will score higher than men on defusing angry behaviour. Because non-injurious angry behaviours are, by their nature, not directed at another person, we predict that there will be no effects of target[2] on the use of these behaviours.

[2] Although referring to a person as a *target* generally implies that some act – such as aggression – is directed towards them, in this chapter the word target will simply be used to denote the object of a person's anger. This means that although non-injurious angry behaviours are, by their nature, not

Method

Participants

An invitation to take part in the study was distributed by email to students at universities in the north of the UK. This email included a link which took participants directly to the webpage on which the questionnaire was hosted. No payment or other incentive was offered for participation. Two hundred and ten participants completed the questionnaire. Thirty six were dropped from the analysis because their sexual orientation was not heterosexual. This was the only exclusion criterion applied. Removing these participants left 115 women and 59 men. All but 16 of the sample were university students (we believe some students forwarded the email to friends, some of whom were not undergraduates). The mean ages of the male (20.5) and female (20.2) participants did not differ (F (1, 173) = 0.53, n.s.)

Procedure

Respondents completed the questionnaire online. An information page and consent form were presented before the questionnaire, informing the participant of the nature of the study. Participants were reminded that their participation was entirely voluntary. A button labelled “Withdraw” was placed at the bottom corner of every page and participants were informed that they could use this to withdraw from the study at any time without penalty. At the beginning of the questionnaire, the age, sex, and sexual orientation of each participant was recorded.

directed at a particular person, if they are a response to something that an individual has done then that individual will be referred to as the target.

Measures

Angry behaviour measures. Following Campbell and Muncer (2008), aggression and angry behaviour were measured using a 16-item questionnaire made up of four 4-item subscales: verbal aggression (e.g. “swear at the other person”); physical aggression (e.g. “kick, bite, or hit the other person with a fist”); explosive angry behaviour (e.g. “when you are by yourself, throw something at the wall”); and defusing angry behaviour (e.g. “Let off steam by talking to a close friend about it later”).

Vignette scenarios. Participants were given three hypothetical targets: a partner, a same-sex best friend, and opposite-sex best friend. Each of these was described identically. Participants were asked to imagine: “You have a (partner/same-sex best friend/opposite-sex best friend) that you have known for three years... You trust them implicitly and you feel you know them inside out – better than anyone.” Two scenarios were then described. The first (the Work scenario) ran as follows:

> You are exceptionally busy and your best friend offers to hand in a piece of work for you to save you time. The deadline was at four, so a couple of hours beforehand you rang them up to make sure that they had handed the work in. They said they had and that you didn’t need to worry. However, you later find out that they were lying and that they hadn’t handed it in on time. You are now in trouble for handing in a late piece of work that may not get marked at all.

The second (the Secret scenario) ran as follows:

> You confide in your best friend a very personal secret that you trust they will not share with anyone. However, you find out that they have been gossiping about this secret behind your back with other people. You did not want anyone else to know your secret and they knew this.

Each scenario was presented three times – once for each target.

For each scenario, respondents were asked to rate on a 9-point scale how angry they would be with the target. They then rated their likelihood of using each of the 16 acts on the angry behaviour scale. Responses were given on a Likert scale scored from 1 (very unlikely) to 5 (very likely).

Self-reported aggression. In a second part of the questionnaire, respondents were asked how often, in the last two years, they had used each of the 16 acts on the angry behaviour scale with each of three different kinds of target: partners, same-sex others whom they knew well, and opposite-sex others whom they knew well. These responses were also coded on a Likert scale as follows: Never (0), 1-3 times (1), 4-6 times (2), 7-9 times (3), and 10 times or more (4).

Results

Overview of analysis

To minimise familywise error because of the large number of analyses, alpha was set at $p < .01$. Anger ratings were analysed using ANOVA, while angry behaviour ratings were analysed using ANCOVA with anger as a covariate. Greenhouse-Geisser corrections were applied wherever the assumption of sphericity was violated for repeated measures. Target shifts for each sex were calculated as the difference between pairs of targets as a proportion of the pooled standard deviation.

Cronbach's alphas for the four behaviour scales were computed across respondent sex and scenarios, and were high for all four scales: physical aggression (partner =.84, same-sex friend =.87, opposite-sex friend =.88); verbal aggression (partner =.87, same-sex friend =.88, opposite-sex friend =.88); defusing anger (partner =.71, same-sex friend =.76, opposite-sex friend =.77); and explosive anger (partner =.81, same-sex friend =.83, opposite-sex friend =.86).

Correlations between vignette and self-report data were all positive and were significant for most targets (see Table 16). In the cases where they were not, the rates of self-reported aggression were very low, indicating that a floor effect may have attenuated the correlation. On the whole, respondents who had engaged in more actual aggression in the past two years reported higher aggression on the vignette part of the study.

Anger ratings. Anger ratings for the two scenarios across all three targets can be found in Table 15. A 2 (respondent sex) by 2 (scenario) by 3 (target) ANOVA was run for the anger ratings. The significant main effect of sex ($F(1, 172) = 7.93$, $p < .01$) indicated that women rated the vignettes as being significantly more anger-provoking than men. There was also a main effect of scenario ($F(1, 172) = 30.80$, $p < .001$); the secret scenario was judged as more anger-provoking than the work scenario for all three targets. This is consistent with the results of Tee (2007). There was no significant effect of target, nor were there any interaction effects. In subsequent analyses of angry and aggressive behaviour, ratings were averaged across the two scenarios. Anger was used as a covariate.

Table 15:

Anger ratings by participant sex, scenario, and target

Target	Male anger rating (SE)		Female anger rating (SE)		Sex difference (F)	Difference between scenarios (F)
	Work	Secret	Work	Secret		
Partner	6.2 (.19)	6.8 (.19)	7.0 (.13)	7.5 (.11)	16.81***	18.62***
Same-sex best friend	6.7 (.18)	7.0 (.20)	6.9 (.12)	7.5 (.12)	3.58	15.15***
Opposite-sex best friend	6.4 (.19)	7.1 (.18)	7.0 (.12)	7.4 (.12)	6.55*	28.07***

Note: Male N = 59, Female N = 115

The main analysis was conducted using an analysis of covariance with sex of participant (between subjects), target (repeated measure), and the form of angry behaviour (within subjects) as the independent variables and anger as the covariate. Self-rated likelihood of behaviour (averaged across both scenarios) was the dependent variable. There was no main effect of sex ($F(1,172) = 1.36$, n.s.), target ($F(1.88, 778.91) = 0.59$, n.s.), or behaviour type ($F(2.75, 778.91) = 2.54$, n.s.). There were significant interactions between target and respondent sex ($F(1.88, 778.91) = 44.00$, $p < .001$), and between behaviour type and sex ($F(2.75, 778.91) = 22.04$, $p < .001$), but not between target and behaviour type ($F(4.56, 778.91) = 1.04$, n.s.). Of principal interest was the three-way interaction, which was also significant ($F(4.56, 778.91) = 18.55$, $p < .001$). This analysis was followed up with four separate two-way ANCOVAs, one for each behaviour type, with sex of participant and target as independent variables and self-reported likelihood of behaviour as the dependent variable.

Physical aggression. There was no main effect of sex (F (1,171) =0.26, n.s.) or target (F (1.81, 309.79) = 0.05, n.s.) on reported likelihood of using physical aggression. The interaction, however, was significant (F (1.81, 309.79) =28.66, p <.001). In agreement with previous findings, women were more likely than men to report that they would use physical aggression towards partners (F (1,172) =12.22, p <.001, d = –0.63), while men were more likely than women to report that they would use physical aggression against same-sex friends (F (1,172) =13.22, p <.001, d =0.57). There was no significant sex difference in hypothetical use of physical aggression towards opposite-sex friends (F (1,172) =2.23, n.s.).

Men rated physical aggression towards same-sex friends as significantly more likely than physical aggression towards both opposite-sex friends (p <.001) and partners (p <.01). They were equally unlikely to physically aggress against opposite-sex friends and partners. In other words, the sex of the target influenced the likelihood of reported physical aggression, but whether an opposite-sex target was a friend or a partner made no difference.

For women, the picture was different: Women reported that physical aggression towards a partner was significantly more likely than physical aggression towards a friend of either the same (p <.001) or the opposite (p <.01) sex. Physical aggression towards same-sex and opposite-sex friends did not differ. In other words, for women, it appears to be primarily the nature of the relationship with the target that influences the likelihood of physical aggression.

Verbal aggression. The pattern of results for verbal aggression was identical to that for physical aggression. There was no main effect of sex (F (1, 172) =0.40, n.s.) or of target ($F (1.75, 298.89) = 0.01$, n.s.), but the interaction was significant ($F (1.75, 298.89) = 50.38$, $p < .001$). Women were more likely than men to report that they would use verbal aggression towards partners ($F (1,172) = 10.68$, $p < .01$, $d = -0.53$), while men were more likely than women to report that they would use verbal aggression against same-sex friends ($F (1,172) = 21.99$, $p < .001$, $d = 0.76$). There was no significant sex difference in hypothetical use of verbal aggression towards opposite-sex friends ($F (1,172) = 0.01$, n.s.).

For men, verbal aggression towards same-sex friends was rated as significantly more likely than verbal aggression towards both opposite-sex friends ($p < .001$) and partners ($p < .001$). Men were equally unlikely to aggress verbally against opposite-sex friends and partners. This suggests that – as with physical aggression – it is the sex of the target that is important in determining the likelihood of verbal aggression.

Table 16:

Likelihood of using angry behaviour in response to provocation by participant sex, behaviour type, and target.

Vignette target	Behaviour type	Mean (SE)		Prevalence[a]		Correlation with self report	
		Male	Female	Male	Female	Male	Female
Partner	Physical aggression	4.52 (.16)	5.76 (.18)	29	65	.25	.39***
	Verbal aggression	8.42 (.40)	10.66 (.32)	90	96	.34**	.59***
	Explosive NIAB	7.44 (.33)	7.08 (.25)	93	87	.55***	.63***
	Defusing NIAB	10.16 (.29)	13.51 (.25)	97	99	.33*	.45***
Same-sex best friend[b]	Physical aggression	5.44 (.28)	4.69 (.13)	52	36	.27*	.08
	Verbal aggression	10.94 (.50)	9.13 (.31)	96	93	.51***	.62***
	Explosive NIAB	7.50 (.38)	6.49 (.25)	90	69	.56***	.63***
	Defusing NIAB	9.88 (.33)	12.67 (.28)	97	98	.41**	.39***
Opposite-sex best friend[c]	Physical aggression	4.54 (.18)	4.93 (.15)	22	36	.11	.08
	Verbal aggression	8.74 (.39)	9.27 (.33)	91	89	.24	.39***
	Explosive NIAB	7.11 (.40)	6.50 (.26)	76	70	.39**	.43***
	Defusing NIAB	10.03 (.33)	12.53 (.28)	97	98	.07	.26**

Note: Male N = 59, Female N = 115. Possible scores on the angry behaviour measures range from 4-20. [a]Defined as the percentage of participants not rating all behaviours as 'very unlikely' [b]Comparison is with self-reported aggression towards someone of the same sex whom the participant knew well. [c]Comparison is with self-reported aggression towards someone of the opposite sex whom the participant knew well.

For women, verbal aggression towards partners was rated as significantly more likely than verbal aggression towards both same-sex friends ($p <.001$) and opposite-sex friends ($p <.001$). Women reported that they were equally unlikely to aggress verbally against same-sex and opposite-sex friends. For women, it again appears to be the relationship to the target that determines the level of verbal aggression, rather than the sex of the target.

Explosive anger expression. The main effect of sex was nonsignificant ($F (1,171) =5.72$, $p = .02$), as were the effect of target ($F (1.83, 312.36) = 0.48$, n.s.), and the interaction ($F (1.83, 312.36) = 3.52$, n.s.). Because there was no significant interaction, no follow-up analyses were performed.

Defusing anger expression. This time, there was a strong main effect of sex ($F (1,171) =40.05$, $p <.001$, $d =-1.03$). Because one of the items "Cry because they are making you so angry" is an action more characteristic of women than men, we recomputed the analysis with this item omitted. The effect of participant sex was still significant ($F (1,171) =10.13$, $p <.01$, $d =-0.52$), but the main effect of target ($F (1.69, 289.54) = 3.19$, n.s.) and the interaction ($F (1.69, 289.54) = 2.09$, n.s.) were nonsignificant.

Target shifts. For physical and verbal aggression, the within-subjects shift between targets was computed for men and women separately. The effect sizes for the target shifts can be found in Table 17. We use opposite-sex friends as the reference category. The comparison between aggression towards opposite-sex friends with aggression towards same-sex friends demonstrates the effect of target sex, with relationship held constant. The comparison between aggression towards opposite-sex friends and partners demonstrates the effect of relationship, with target sex held constant. As Table 17 shows, the effect of target sex is small and nonsignificant for women, and moderate and significant for men. Conversely, the effect of intimacy with the target is moderate and significant for women, and small and nonsignificant for men.

Table 17

Target shifts for self-rated likelihood of angry behaviour in vignette scenarios by participant sex, behaviour type, and target

Target and form of angry behaviour	Sex difference (d)	Women's target shift (d) relative to opposite-sex best friend	Men's target shift (d) relative to opposite-sex best friend
Physical aggression to opposite-sex friend	-0.15		
Physical aggression to same-sex friend	0.57***	-0.16*	+0.58***
Physical aggression to partner	-0.63***	+0.51***	+0.00
Verbal aggression to opposite-sex friend	0.01		
Verbal aggression to same-sex friend	0.76***	-0.05	+0.70***
Verbal aggression to partner	-0.52**	+0.44***	-0.09

Note: Male N = 59, Female N = 115. *d* represents the difference between measures divided by the pooled standard deviation. Significance of sex differences and within-sex effects are tested by ANCOVA with pairwise comparisons.

* p < .05; ** p < .01; *** p < .001

Discussion

The present study used vignette scenarios to examine respondents' estimated likelihood of using various forms of aggression, as a function of the sex of the target and the respondents' relationship to the target. To address the problem of confounding respondent sex with target sex or target sex with relationship type, we asked participants to imagine an opposite-sex friend in addition to the other two targets. Our results indicate that the now well-established target paradox is caused by both an inhibition of male aggression towards intimate partners and a disinhibition of female aggression towards intimate partners. In men, this shift appears to be an effect of target sex while, in women, it is an effect of intimacy with the target. Furthermore, we have established that these target shifts are specific to direct aggression and do not extend to non-aggressive forms of anger expression. In this section, we consider direct aggression and non-injurious angry behaviour in turn, before considering limitations and wider implications.

Physical and verbal aggression

The absence of overall sex differences on physical or verbal aggression in the hypothetical scenarios is unsurprising: Participants' anger ratings implied a high degree of provocation, which has been shown to diminish the sex difference in aggression (Bettencourt & Miller, 1996). Furthermore, given that partner aggression is higher for women, same-sex aggression is higher for men, and aggression to opposite-sex friends does not differ between the sexes, averaging across targets gives the appearance of no sex difference. This highlights once more the importance of considering the effect of target on sex differences in aggression.

Women rated themselves as significantly more likely than men to use physical and verbal aggression against a partner in a hypothetical provoking scenario. The present results are concordant with Archer's (2000a) finding of a small to moderate effect size in the female direction in student samples. The use of the same scenario for both sexes adds to the evidence that partner aggression by women cannot be explained completely by self-defence or retaliation (Straus, 1999).

Men report an equally low likelihood of aggression towards female targets, regardless of whether they are partners or friends. This may be the result of internalised chivalry norms which state that men's aggression towards women is more reprehensible than aggression towards other men (Davidovic et al., 2010; Felson, 2002), even if the aggression is retaliatory (Feld & Felson, 2008). Given that men's aggression is inhibited towards all women and not just partners, this raises the question of why women do not aggress towards all men and not just partners. In the present study, the result cannot be an effect of greater provocation from partners, because provocation was held constant.

College women who strike their partners state that they do not fear retaliation because they know that their partners have been 'trained' not to hit women (Fiebert & Gonzalez, 1997). It appears, however, that this disinhibition of aggression does not extend to non-intimate men, despite the fact that a normative protection of all women from aggression would protect women from them as well. Chivalry norms, therefore, cannot fully explain the target shift in women's aggression. In contrast, Campbell's (2008, 2010) argument – that the oxytocin-mediated pair-bond and its resultant reduction in fear disinhibits female aggression towards partners – predicts that women will only raise their aggression towards intimate partners and not towards other men. The present data support this argument. The proposed proximate mechanism of reduced fear, as opposed to knowledge of norms, is consistent with the argument that risky behaviour – of which aggression is a prime example – is not founded on cognitive calculation but on emotional processes founded at a more basal level (Loewenstein, Weber, Hsee, & Welch, 2001).

Non-injurious anger expression

As hypothesised, there was no effect of target on likelihood ratings for explosive or defusing actions. This uniform 'propriety' across relationships held for men and women. It appears that, because non-injurious angry behaviours do not involve an attack on another individual, their perceived appropriateness is not influenced by the characteristics of the provocateur such as their sex. This supports the categorisation of non-injurious angry behaviours as forms of emotion expression distinct from aggression.

Women, as anticipated, rated themselves as being more likely to use defusing actions than men. This is concordant with previous observations on women's strategies for coping with anger (Campbell & Muncer, 2008; Kring, 2000), and with the evolutionary argument that sex-specific selection pressures resulted in support-eliciting emotion expression in women (S. E. Taylor et al., 2000; Vigil, 2009). Although men's likelihood ratings for explosive actions were higher than women's, this difference was not significant as expected. It is possible that sex differences in the use of explosive actions, like those in the use of direct aggression (Bettencourt & Miller, 1996), are diminished by high levels of provocation.

Anger

The sex difference in anger is consistent with previous research: Although men and women do not differ in the frequency of anger (Kring, 2000) Fehr et al. (1999) found that women rate betrayal of trust and negligence by partners as more anger-provoking than men. The absence of an effect of target, or a target by sex interaction, on anger ratings means that anger cannot account for target shifts in aggressive behaviour. The inclusion of anger as a covariate also means that respondent sex was not confounded with anger.

Limitations and implications

While a particular strength of the vignette data lies in the fact that provocation and length of relationship are held constant across the different targets, the limitations of such data should be noted. Since the 'real-world' frequency of conflict is likely to vary between targets, it is not possible to determine whether the actual frequency of aggression towards a particular target is the result of its perceived acceptability or the amount of conflict. That said, the correlations between self-report and vignette data provide important evidence for the validity of the vignette data.

One important limitation of the present study is that participants might have interpreted the vignette scenarios differently. In particular, the vignettes do not specify whether the target confesses their transgression directly to the participant, or whether the participant finds out about it from a third party. Participants are likely to imagine different responses depending on whether they are imagining themselves in the presence of the target immediately, or after a delay. Further work using vignettes should specify this. A further limitation is that the relationship history of the participants was not recorded. Some of the participants might not have had a serious relationship and this might make their estimate of how they would behave in response to provocation by a partner less accurate. Future studies could exclude data from participants who report not having had an intimate partnership.

The present results indicate that women raise their aggression towards intimate partners because their fear of aggressing is reduced compared to other targets. However, intimate partner violence is most frequently mutual (Straus & Ramirez, 2007), and women are more likely than men to be injured through intimate partner violence (Archer, 2000a). This means that any perception women might have that aggression towards their partners is safe could ultimately be harmful to them. Future work on intimate partner violence might usefully examine the processes by which women evaluate the risks involved in aggressing towards an intimate partner.

The perceived status of explosive forms of anger expression could also provide a fruitful avenue of research. The use of explosive forms of anger expression does not vary depending on characteristics of the provocateur, which suggests that they are seen as a legitimate response to anger in any context. However, explosive actions are positively correlated with direct aggression (Campbell & Muncer, 2008). Furthermore, personality characteristics – such as risky impulsivity – associated with direct aggression are also correlated with explosive angry behaviour (Campbell & Muncer, 2009), which suggests that they might share common risk factors. If explosive actions make aggression more likely, then a perception that they are a safe and legitimate response to conflict might result in escalation.

In conclusion, the present study suggests that men inhibit their aggression towards female partners not because they are partners, but because they are women. It also indicates that women raise their aggression towards partners not because they are men, but because they are partners. Furthermore, the effects of target are specific to direct aggression and do not generalise to non-injurious forms of anger expression. Further work could more directly examine the role of beliefs about safety and legitimacy of different forms of angry behaviour in intimate partnerships, and their actual consequences.

Supplementary Analysis of Self-Report Measures

The analysis of the self-report data confirmed the patterns found in the vignette data: For men, involvement in direct aggression appeared to be a function of the sex of the target; while for women it appeared to be a function of both the sex of the target and the intimacy with the target.

Measures

Respondents were asked how often, in the last two years, they had used each of the 16 acts on the angry behaviour scale with five different types of target: partners, same-sex others who they knew well, opposite sex others who they knew well, same-sex others who they did not know well, and opposite sex others who they did not know well. These responses were also coded on a Likert scale coded as follows: Never (0), 1-3 times (1), 4-6 times (2), 7-9 times (3), and 10 times or more (4).

Results

Prevalence data. The percentages of men and women reporting at least one act in each category of behaviour are shown in Table 18. Prevalence of verbal aggression was over 50% towards most targets. Prevalence rates for physical aggression, however, are generally low. This point will be returned to in the discussion.

Table 18:

Prevalence of verbal and physical aggression in self-report data

Type of behaviour	Target	Prevalence	
		Men	Women
Verbal aggression	Partner	59	83
	Same-sex, known well	97	89
	Opposite-sex, known well	14	23
	Same-sex, not known well	86	89
	Opposite-sex, not known well	58	50
Physical aggression	Partner	12	30
	Same-sex, known well	47	15
	Opposite-sex, known well	25	4
	Same-sex, not known well	14	23
	Opposite-sex, not known well	7	10
Defusing angry behaviour	Partner	76	92
	Same-sex, known well	93	99
	Opposite-sex, known well	75	64
	Same-sex, not known well	95	96
	Opposite-sex, not known well	64	63
Explosive angry behaviour	Partner	39	49
	Same-sex, known well	63	45
	Opposite-sex, known well	41	19
	Same-sex, not known well	64	41
	Opposite-sex, not known well	36	19

Note: Prevalence is defined as the percentage of respondents reporting at least one act in the last two years.

MANOVA. As in the paper, the analysis was conducted using a MANOVA. This time, anger was not included as a covariate because trait anger was not measured. Because the number of target categories was now five instead of three, and because combining scores for verbal and physical aggression improved scale reliability (alphas for verbal aggression ranged from .58 to .76 and alphas for physical aggression ranged from .59 to .77, whereas alphas for the combined aggression measure ranged from .64 to .77), the verbal and physical aggression measures were combined to form a single direct aggression scale. This reduced the total number of analyses slightly.

The analysis was therefore a 2 (sex) by 5 (target) multivariate ANOVA with 3 dependent variables (direct aggression, explosive anger expression and defusing anger expression). This revealed a main effect of sex ($F(3, 170) = 17.30$, $p < .001$), a main effect of target ($F(12, 161) = 29.76$, $p < .001$), and a significant sex by target interaction ($F(12, 161) = 15.62$, $p < .001$). This analysis was followed up by three separate 2 (sex) by 5 (target) ANOVAs.

To control the risk of familywise error, alpha was set at $p = .01$. Tests of sex differences by target are corrected for non-homogenous variances where appropriate. Greenhouse-Geisser corrections were applied wherever the assumption of sphericity was violated for repeated-measures factors. Figure 3 shows the mean scores on defusing angry behaviour, explosive angry behaviour, and direct aggression, by sex.

Direct aggression. As anticipated, men scored higher than women on direct aggression, but the main effect of sex only approached significance ($F(1, 171) = 5.10$, $p = .03$, $d = 0.36$). The main effect of target was significant ($F(2.77, 477.05) = 68.03$, $p < .001$), as was the sex by target interaction ($F(2.77, 477.05) = 36.43$,

$p < .001$). Women reported significantly more aggression towards partners than men did ($F(1, 173) = 11.74$, $p = <.001$, $d = -0.53$), while men reported significantly more aggression towards friends of both the same ($F(1, 173) = 34.24$, $p = <.001$, $d = 0.86$) and the opposite ($F(1, 173) = 22.20$, $p = <.001$, $d = 0.71$) sex. There were no significant sex differences in self-reported aggression towards strangers.

Means for self-reported aggression can be found in Figure 3 (left panel). For women, direct aggression towards partners was highest; it was significantly higher than aggression towards opposite sex friends or strangers ($p < .001$), but not significantly higher than aggression towards same-sex friends or strangers. Aggression towards same-sex targets did not differ depending on whether they were friends or strangers; both were significantly higher ($p < .001$) than aggression towards opposite-sex friends and strangers, which in turn did not differ from each other. This indicates that, for women, the sex of the target determines the level of aggression – with men provoking less – unless the target is a partner in which case aggression is raised to levels similar to aggression towards same-sex targets.

For men, aggression towards partners did not differ significantly from aggression towards opposite-sex friends, although direct aggression towards strangers was significantly lower ($p < .001$) than the latter of these. Aggression towards same-sex friends and strangers were both significantly higher ($p < .001$) than aggression towards any female target, while aggression towards same-sex friends was significantly higher ($p < .001$) than towards same-sex strangers. This indicates that, for men, the sex of the target determines the level of aggression: Women receive less, and partners and opposite-sex friends receive the same amount. When the target is of the same sex, more aggression is directed towards people the respondent knows well.

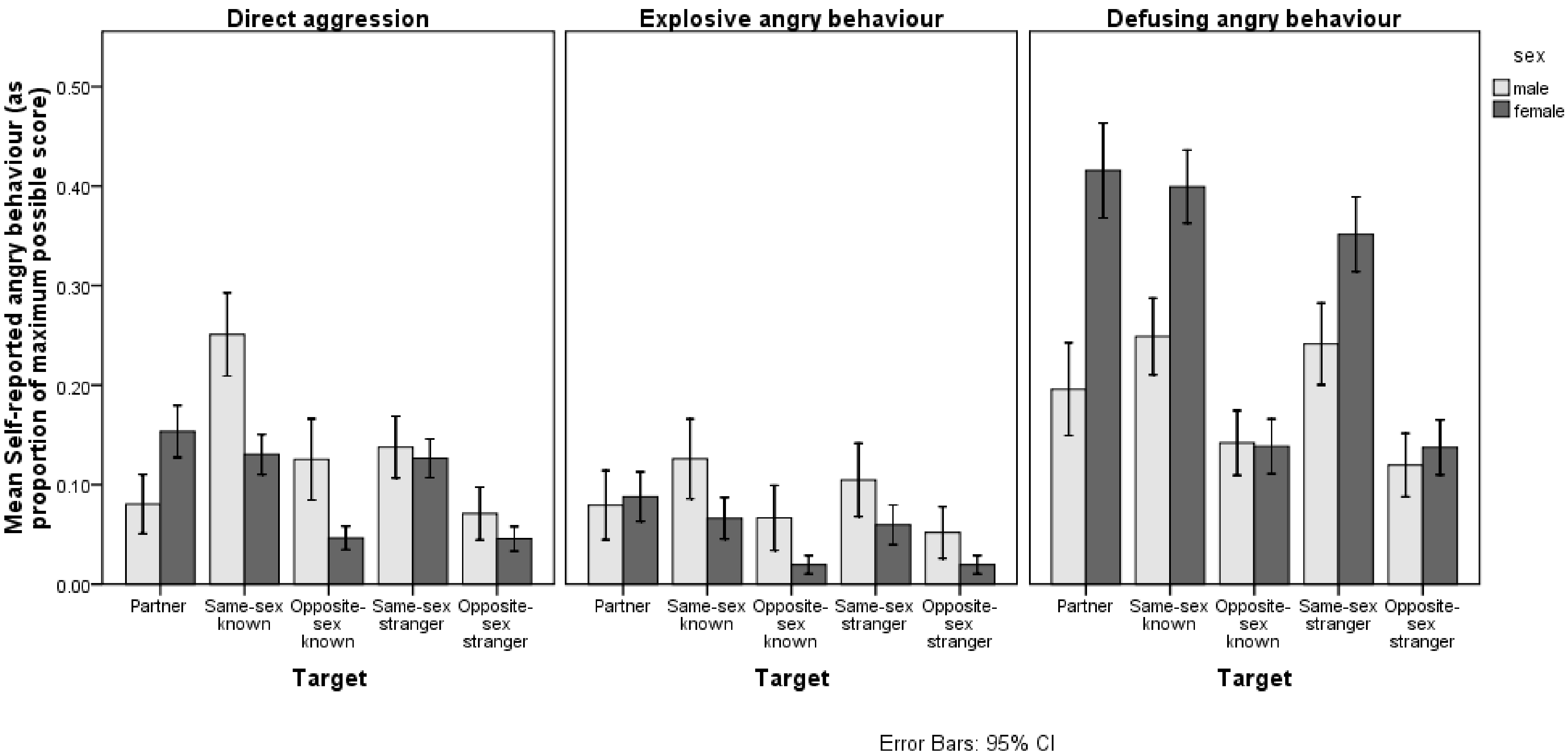

Figure 3. Mean self-reported defusing angry behaviour, explosive angry behaviour, and direct aggression, by sex of respondent

Explosive anger expression. As with direct aggression, men scored higher than women on explosive anger expression, but the main effect of sex was marginal ($F(1, 171) = 5.69$, $p = .018$, $d = 0.38$). The main effect of target was significant ($F(2.55, 45.55) = 24.73$, $p < .001$), as was the sex by target interaction ($F(2.55, 45.55) = 5.90$, $p < .01$).

There were no sex differences in explosive anger expression in response to partners, or strangers of either sex. However, men reported significantly more explosive anger expression than women in response to friends of the same ($t(90.86) = -2.64$, $p < .01$) and the opposite ($t(67.66) = -2.79$, $p < .01$) sex.

Means for explosive anger expression can be found in Figure 3 (middle panel). For women, explosive anger expression in response to partners was highest; it was significantly higher than all other relationships except same-sex friends. Explosive anger expression in response to same-sex targets did not differ depending on whether they were friends or strangers; both were significantly higher ($p < .001$) than explosive anger expression in response to opposite-sex friends and strangers, which in turn did not differ from each other. This indicates that, for women, the sex of the target determines the level of explosive anger expression – with men provoking less – unless the target is a partner in which case explosive anger expression is raised to levels similar to aggression in response to same-sex targets. In other words, explosive angry behaviour appears to follow the same pattern between targets as direct aggression.

For men, explosive anger expression was equally high with same-sex friends and strangers; explosive anger expression in response to both same-sex targets was significantly higher than explosive anger expression in response to opposite-sex friends and strangers. However, explosive anger expression in response to partners was at an intermediate level which did not differ significantly from any other target. In other words, for men, the sex of the target determines the level of explosive anger expression – with women provoking less – unless the target is a partner in which case explosive anger expression is not significantly lower than explosive anger expression in response to same-sex targets. This suggests that reported use of explosive angry behaviour is sensitive to target sex in a similar way to direct aggression, but use of explosive angry behaviour in response to female targets might also be sensitive to intimacy in a way that direct aggression is not.

Defusing anger expression. The main effect of sex (F (1,171) = 18.68, $p < .001$, $d = -0.66$), the main effect of target (F (2.47, 598.13) = 93.53, $p < .001$), and the interaction (F (2.47, 598.13) = 21.78, $p < .001$) were all significant. Women reported significantly more defusing anger expression than men in response to partners (t (156.98) = 6.56, $p < .01$), same-sex friends (t (150.00) = 5.63, $p < .01$) and same-sex strangers (t (145.04) = 3.95, $p < .01$), but there were no sex differences in defusing angry behaviour in response to opposite-sex friends or strangers.

Means for defusing anger expression can be found in Figure 3 (right panel). For women, defusing angry behaviour in response to same-sex friends and partners was uniformly high and significantly higher than all other targets ($p < .001$), except for the contrast between partners and same-sex strangers, which was non-significant. Defusing angry behaviour in response to opposite-sex friends and strangers was uniformly low and significantly lower than all other targets. Defusing angry behaviour in response to same-sex strangers was significantly lower than in response to partners or same-sex friends but significantly higher than opposite-sex friends or strangers. This indicates that partners resemble same-sex friends most in the levels of defusing behaviour they elicit while, again, opposite-sex targets who are not partners are the targets of less angry behaviour than either partners or same-sex targets. This suggests that, for women, defusing angry behaviour shows the same pattern as explosive angry behaviour.

For men, defusing angry behaviour was uniformly high for same-sex friends and strangers. These two targets elicited significantly more ($p < .001$) defusing angry behaviour than opposite-sex friends or strangers but not partners. Defusing angry behaviour was uniformly low in response to opposite-sex friends and strangers. Partners received a degree of defusing angry behaviour which, although significantly higher than opposite-sex strangers ($p < .01$), was not significantly different from any other target. In other words, for men, the sex of the target determines the level of explosive anger expression – with women provoking less – unless the target is a partner, in which case defusing anger expression is not significantly lower than defusing anger expression in response to same-sex targets. In other words, defusing angry behaviour followed much the same pattern as explosive angry behaviour.

Discussion

The results of this analysis support and extend those of the main paper with regard to direct aggression. Concordant with the large body of previous research, men scored higher than women on aggression towards same-sex known targets, while women scored higher than men on aggression towards partners. The significant sex difference in aggression towards opposite-sex known targets might be a further reflection of the fact that, men's aggression is inhibited towards all opposite-sex relative to same-sex targets, whereas women's aggression towards opposite-sex targets who are not partners is not disinhibited. This means that the sex difference in aggression does not reverse in the case of opposite-sex targets who are not partners because only one sex is showing a target shift.

Men's direct aggression is inhibited towards women, whether they are strangers, friends, or partners. This implies that men refrain from aggressing towards partners relative to same-sex targets because they are women, not because they are partners. Women's aggression towards men appears to be inhibited when the man is not an intimate partner but disinhibited when he is – indeed, as with the vignette data, aggression towards partners is higher than towards any other target. This provides further evidence that women generally refrain from aggressing towards men, owing to the physical danger involved, and their raised aggression within the context of an intimate partnership occurs not because their partners are male but because of the level of intimacy within the relationship. These findings are consistent with those in Chapter Three, in which women's aggressive behaviour showed a smaller shift than men's as a result of the sex of the target: Because women's aggression is only disinhibited towards certain male targets, while men's aggression is inhibited towards all female targets, this might account for the larger effect of target sex in men.

With regard to sex differences, the present results are consistent with those of the main paper. Although there was no sex difference in aggression in the vignette data and a trend towards higher male aggression in the self-report data, this might be the result of the vignettes containing scenarios which specified a high level of provocation. Sex differences were found in defusing angry behaviour, regardless of the method of data collection. Although sex differences in explosive angry behaviour only approached significance in both datasets, the effect sizes ($d = 0.25$ for vignette data and d = 0.38 for self report) suggest that this form of angry behaviour is more characteristic of men.

In the vignette data, explosive and defusing angry behaviour showed no target shifts, while in the self-report data there were effects of target. Men's explosive and defusing angry behaviour is lower in response to women than it is in response to men, regardless of the relationship between target and actor, but the difference becomes non-significant for the comparison between same-sex targets and partners. For women, explosive and defusing anger expression seem to vary by target in the same way as direct aggression: Both forms of behaviour used in response to men less than to provocation by women, except in the case of partners, where their use is disinhibited.

The target shifts in direct aggression are robust across methods of data collection. In contrast, the target shifts in explosive and defusing angry behaviour appear only in self-report data, where they mirror those found for direct aggression. This might shed light on the reason for the apparent target shifts. As noted in the introduction to this chapter, one of the weaknesses of self-report data is that the frequency and duration of interaction – and therefore the amount of opportunity for conflict – is confounded with the type of target.

With regard to direct aggression, the concordance between the self-report and vignette data suggests that the target effects are not simply an effect of the amount of interaction or conflict: Whether provocation is held constant or allowed to vary, men report being equally unlikely to aggress towards a female target regardless of their relationship, while women's reports of opposite-sex aggression depend on the relationship to the target. This suggests that the perceived safety or legitimacy of acting aggressively has a strong impact on actual aggressive behaviour, in addition to any effects of differing provocation that might exist. However, with regard to explosive and defusing angry behaviour, target effects only occur when provocation is not held constant. This suggests that the apparent target shifts are the function of differing provocation, rather than any effects of perceived safety or legitimacy. This is consistent with the status of non-injurious angry behaviour as anger expression rather than aggression. This would explain why explosive and defusing angry behaviour is higher for same-sex targets for both sexes: The majority of social interaction is between same-sex individuals (Mehta & Strough, 2009). It would also explain why there is a slight trend for men's levels of explosive and defusing angry behaviour in response to partners to resemble those in response to same-sex targets rather than opposite-sex targets: The level of conflict between partners is known to be high relative to non-intimates (Felson et al., 2003).

One of the explanations posited for women's raised levels of intimate partner aggression in Western cultures is that the prevailing strong chivalry norms mean that women do not fear retaliation. However, if men's aggression is inhibited towards all women and not just intimate partners, and this prohibition applies to retaliation as well as striking first, then we might expect women's aggression to be disinhibited towards all male targets: clearly this is not the case. Women refrain from aggressing towards men who are not their partners despite the fact that societal norms make retaliation relatively unlikely. Furthermore, even in societies where women frequently live with their husband's kin, they aggress against their husbands far more frequently than any of their other in-laws despites having exactly the same amount of (non)relatedness (Burbank, 1987). Given that women's disinhibited aggression is specific to intimate partners, chivalry norms alone seem unlikely to account for it. This provides further support for the hypothesis that women fear intimate partners less than other men because of the intimacy of their relationship. This in turn provides further support for the hypothesis that sexual and aggressive behaviours share a common proximate mechanism – when women feel comfortable enough with a partner to have sex this also means that they are comfortable expressing aggressive impulses more freely.

Limitations

The present sample consisted almost entirely of UK undergraduates and generalisations cannot, therefore, be made to other populations. Furthermore, the prevalence of physical aggression in the self-report data was low, which means that caution must be exercised when interpreting the analysis: Much of the aggression reported by these participants is verbal, and although the self-report and vignette data show good concordance in the present sample this result might only hold true for verbal aggression and would need to be replicated in a sample with higher rates of physical aggression. Gathering data from a larger sample would therefore ensure more robust estimates of differences between sexes and targets.

The self-report section of the questionnaire asked participants to report aggression towards same-sex and opposite-sex targets whom they knew well, rather than asking specifically about aggression towards close friends. The specification of the targets is therefore not identical across the two forms of report. This introduces a potential source of error into the results, because men and women might be thinking of different kinds of relationship when answering the self-report questions. For example, people known to the participant might be work colleagues, family members, or members of clubs or sports teams; the nature of interactions between these different types of target is therefore likely to differ. Any tendency for men and women to think of different kinds of acquaintance might obscure or inflate sex differences in aggression. A further point to consider is that aggressive behaviour often takes place between ex-partners. (Brownridge et al., 2008). Participants could consider ex-partners to belong in the ‘partner’ category or in the ‘someone of the opposite sex whom I know well’ category. Any sex difference in the tendency to classify ex-partners might also affect results. With a sufficiently large sample, examining ex-partners as a separate category might prove instructive.

Conclusions

The present chapter presented evidence that the target paradox is the result of two different processes: firstly, men lower their aggression towards all women relative to men; this therefore means that their intimate partner aggression is lower than their same-sex aggression. Secondly, women raise their aggression specifically towards intimate partners. Furthermore, this result is the same for both vignette reports of hypothetical aggression and self-reports of actual aggression. This indicates that the target paradox is an effect of both target sex and intimacy, but that the former is more salient for men and the latter is more salient for women. The next chapter considers how cultural norms and biological factors might interact to produce these two different effects on aggressive behaviour.

References

Archer, J. (1994). Introduction. In J. Archer (Ed.), *Male violence* (pp. 1-20). London: Routledge.

Archer, J. (1999). Assessment of the reliability of the conflict tactics scales: A meta-analytic review. *Journal of Interpersonal Violence, 14*, 1263-1289. doi:10.1177/088626099014012003.

Archer, J. (2000a). Sex differences in aggression between heterosexual partners: A meta-analytic review. *Psychological Bulletin, 126*, 651-680. doi:10.1037/0033-2909.126.5.651.

Archer, J. (2000b). Sex differences in physical aggression to partners: A reply to Frieze (2000), O'Leary (2000), and White, Smith, Koss, and Figueredo (2000). *Psychological Bulletin, 126*, 697-702. doi:10.1037/0033-2909.126.5.697.

Archer, J. (2002). Sex differences in physically aggressive acts between heterosexual partners: A meta-analytic review. *Aggression and Violent Behavior, 7*, 313-351. doi:10.1016/S1359-1789(01)00061-1.

Archer, J. (2004). Sex differences in aggression in real-world settings: A meta-analytic review. *Review of General Psychology, 8*, 291-322. doi:10.1037/1089-2680.8.4.291.

Archer, J., Parveen, S., & Webb, I. A. (2010). *Sex differences in aggression against partners and same-sex individuals*. Unpublished manuscript.

Archer, J., & Webb, I. A. (2006). The relation between scores on the Buss-Perry Aggression Questionnaire and aggressive acts, impulsiveness, competitiveness, dominance, and sexual jealousy. *Aggressive Behavior, 32*, 464-473. doi:10.1002/ab.20146.

Bettencourt, B. A., & Miller, N. (1996). Gender differences in aggression as a function of provocation: A meta-analysis. *Psychological Bulletin, 119*, 422-447. doi:10.1037/0033-2909.119.3.422.

Brownridge, D. A., Hiebert-Murphy, D., Ristock, K. L., Chan, A., Tiwari, K. T., & Santos, S. C. (2008). *Violence against separated, divorced, and married women in Canada, 2004.* Paper presented at the First Biennial Conference of the International Family Aggresion Society, University of Cantral Lancashire, Preston, UK.

Burbank, V. K. (1987). Female aggression in cross-cultural perspective. *Cross-Cultural Research, 21*, 70-100. doi:10.1177/106939718702100103.

Buss, D. M., Larsen, R. J., Westen, D., & Semmelroth, J. (1992). Sex differences in jealousy: Evolution, physiology, and psychology. *Psychological Science, 3*, 251-255. doi:10.1111/j.1467-9280.1992.tb00038.x.

Campbell, A. (2008). Attachment, aggression and affiliation: The role of oxytocin in female social behavior. *Biological Psychology, 77*, 1-10. 10.1016/j.biopsycho.2007.09.001.

Campbell, A. (2010). Oxytocin and human social behavior. *Personality and Social Psychology Review, 14*, 281-295. 10.1177/1088868310363594.

Campbell, A., & Muncer, S. (2008). Intent to harm or injure? Gender and the expression of anger. *Aggressive Behavior, 34*, 282-293. 10.1002/ab.20228.

Campbell, A., & Muncer, S. (2009). Can 'risky' impulsivity explain sex differences in aggression? *Personality and Individual Differences, 47*, 402-406. 10.1016/j.paid.2009.04.006.

Davidovic, A., Bell, K., Ferguson, C., Gorski, E., & Campbell, A. (2010). Impelling and inhibitory forces in aggression: Sex-of-target and relationship effects. *Article submitted for publication*

de Weerth, C., & Kalma, A. P. (1993). Female aggression as a response to sexual jealousy: A sex-role reversal. *Aggressive Behavior, 19*, 265-279. doi:10.1002/1098-2337(1993)19:4<265::AID-AB2480190403>3.0.CO;2-P.

Dobash, R. E., & Dobash, R. P. (1979). *Violence against wives: A case against the patriarchy.* New York: Free Press.

Dobash, R. P., Dobash, R. E., Wilson, M., & Daly, M. (1992). The myth of sexual symmetry in marital violence. *Social Problems, 39*, 71-91. doi:10.1525/sp.1992.39.1.03x0064l.

Fehr, B., Baldwin, M., Collins, L., Patterson, S., & Benditt, R. (1999). Anger in close relationships: An interpersonal script analysis. *Personality and Social Psychology Bulletin, 25*, 299-312. doi:10.1177/0146167299025003003.

Feld, S. L., & Felson, R. B. (2008). Gender norms and retaliatory violence against spouses and acquaintances. *Journal of Family Issues, 29*, 692-703. 10.1177/0192513x07312093.

Feldman, S. S., Cauffman, E., Jensen, L. A., & Arnett, J. J. (2000). The (un)acceptability of betrayal: A study of college students' evaluations of sexual betrayal by a romantic partner and betrayal of a friend's confidence. *Journal of Youth and Adolescence, 29*, 499-523.

Felson, R. B. (2002). *Violence and gender reexamined*. Washington, D.C.: American Psychological Association.

Felson, R. B., Ackerman, J., & Yeon, S. J. (2003). The infrequency of family violence. *Journal of Marriage and the Family, 65*, 622-634. doi:10.1111/j.1741-3737.2003.00622.x.

Felson, R. B., & Feld, S. L. (2009). When a man hits a woman: Moral evaluations and reporting violence to the police. *Aggressive Behavior, 35*, 477-488. 10.1002/ab.20323.

Felson, R. B., & Outlaw, M. C. (2007). The control motive and marital violence. *Violence and Victims, 22*, 387-407.

Fiebert, M. S., & Gonzalez, D. M. (1997). College women who initiate assaults on their male partners and the reasons offered for such behavior. *Psychological Reports, 80*, 583-590.

Finkel, E. J., Rusbult, C. E., Kumashiro, M., & Hannon, P. A. (2002). Dealing with betrayal in close relationships: Does commitment promote forgiveness? *Journal of Personality and Social Psychology, 82*, 956-974. 10.1037//0022-3514.82.6.956.

Goetz, A. T., Shackelford, T. K., Romero, G. A., Kaighobadi, F., & Miner, E. J. (2008). Punishment, proprietariness, and paternity: Men's violence against women from an evolutionary perspective. *Aggression and Violent Behavior, 13*, 481-489. 10.1016/j.avb.2008.07.004.

Golin, S., & Romanowski, M. A. (1977). Verbal aggression as a function of sex of subject and sex of target. *Journal of Psychology, 97*, 141-149.

Graham-Kevan, N., & Archer, J. (2005). Investigating three explanations of women's relationship aggression. *Psychology of Women Quarterly, 29*, 270-277.

Graham-Kevan, N., & Archer, J. (2008). Does controlling behavior predict physical aggression and violence to partners? *Journal of Family Violence, 23*, 539-548. 10.1007/s10896-008-9162-y.

Grice, J. W., & Seely, E. (2000). The evolution of sex differences in jealousy: Failure to replicate previous results. *Journal of Research in Personality, 34*, 348-356.

Haden, S. C., & Hojjat, M. (2006). Aggressive responses to betrayal: Type of relationship, victim's sex and nature of aggression. *Journal of Social and Personal Relationships, 23*, 101-116. 10.1177/0265407506060181.

Harris, C. R. (2003). A review of sex differences in sexual jealousy, including self-report data, psychophysiological responses, interpersonal violence, and morbid jealousy. *Personality and Social Psychology Review, 7*, 102-128.

Hettrich, E. L., & O'Leary, K. D. (2007). Females' reasons for their physical aggression in dating relationships. *Journal of Interpersonal Violence, 22*, 1131-1143. 10.1177/0886260507303729.

Hilton, N. Z., Harris, G. T., & Rice, M. E. (2000). The functions of aggression by male teenagers. *Journal of Personality and Social Psychology, 79*, 988-994. 10.1037/0022-3514.79.6.988.

Kaighobadi, F., Shackelford, T. K., & Goetz, A. T. (2009). From mate retention to murder: Evolutionary psychological perspectives on men's partner-directed violence. *Review of General Psychology, 13*, 327-334. 10.1037/a0017254.

Kring, A. M. (2000). Gender and anger. In A. H. Fischer (Ed.), *Gender and emotion: Social psychological perspectives* (pp. 211-231). Cambridge: Cambridge University Press. doi:10.1017/CBO9780511628191.

Loewenstein, G. F., Weber, E. U., Hsee, C. K., & Welch, N. (2001). Risk as feelings. *Psychological Bulletin, 127*, 267-286. 10.1037//0033-2909.127.2.267.

Mehta, C. M., & Strough, J. (2009). Sex segregation in friendships and normative contexts across the life span. *Developmental Review, 29*, 201-220. 10.1016/j.dr.2009.06.001.

Milardo, R. M. (1998). Gender asymmetry in common couple violence. *Personal Relationships, 5*, 423-438. doi:10.1111/j.1475-6811.1998.tb00180.x.

Miller, S. L., & Maner, J. K. (2008). Coping with romantic betrayal: Sex differences in responses to partner infidelity. *Evolutionary Psychology, 6*, 413-426.

Moffitt, T. E., Krueger, R. F., Caspi, A., & Fagan, J. (2000). Partner abuse and general crime: How are they the same? How are they different? *Criminology, 38*, 199-232. doi:10.1111/j.1745-9125.2000.tb00888.x.

O'Connor, D. B., Archer, J., & Wu, F. W. C. (2001). Measuring aggression: Self-reports, partner reports, and responses to provoking scenarios. *Aggressive Behavior, 27*, 79-101.

Richardson, D. S., & Green, L. R. (2006). Direct and indirect aggression: Relationships as social context. *Journal of Applied Social Psychology, 36*, 2492-2508. doi:10.1111/j.0021-9029.2006.00114.x.

Rose, S. M. (1985). Same-sex and cross-sex friendships and the psychology of homosociality. *Sex Roles, 12*, 63-74. doi:10.1007/BF00288037.

Shackelford, T. K., & Buss, D. M. (1996). Betrayal in mateships, friendships, and coalitions. *Personality and Social Psychology Bulletin, 22*, 1151-1164. oi:10.1177/01461672962211006.

Sorenson, S. B., & Taylor, C. A. (2005). Female aggression toward male intimate partners: An examination of social norms in a community-based sample. *Psychology of Women Quarterly, 29*, 78-96. doi:10.1111/j.1471-6402.2005.00170.x.

Straus, M. A. (1999). The controversy over domestic violence by women: A methodological, theoretical, and sociology of science analysis. In X. B. Arriaga & S. Oskamp (Eds.), *Violence in intimate relationships* (pp. vii, 216): Thousand Oaks, CA, US: Sage Publications, Inc.

Straus, M. A., Gelles, R. J., & Steinmetz, S. K. (1988). *Behind closed doors: Violence in the American family*. Newbury Park: Sage.

Straus, M. A., & Ramirez, I. L. (2007). Gender symmetry in prevalence, severity, and chronicity of physical aggression against dating partners by university students in Mexico and USA. *Aggressive Behavior, 33*, 281-290. 10.1002/ab.20199.

Tangney, J. P., Hill-Barlow, D., Wagner, P. E., Marschall, D. E., Borenstein, J. K., Sanftner, J., et al. (1996). Assessing individual differences in constructive versus destructive responses to anger across the lifespan. *Journal of Personality and Social Psychology, 70*, 780-796. doi:10.1037/0022-3514.70.4.780.

Taylor, S. E., Klein, L. C., Lewis, B. P., Gruenewald, T. L., Gurung, R. A. R., & Updegraff, J. A. (2000). Biobehavioral responses to stress in females: Tend-and-befriend, not fight-or-flight. *Psychological Review, 107*, 411-429.

Taylor, S. P., & Epstein, S. (1967). Aggression as a function of interaction of sex of aggressor and sex of victim. *Journal of Personality, 35*, 474-486. doi:10.1111/j.1467-6494.1967.tb01441.x.

Tee, W. (2007). *Sex differences in same- and opposite-sex agonistic encounters.* Unpublished dissertation, Durham University.

Thornton, A. J. V., Graham-Kevan, N., & Archer, J. (2010). Adaptive and maladaptive personality traits as predictors of violent and nonviolent offending behavior in men and women. *Aggressive Behavior, 36*, 177-186. 10.1002/ab.20340.

Tremblay, P. F., & Ewart, L. A. (2005). The Buss and Perry Aggression Questionnaire and its relations to values, the Big Five, provoking hypothetical situations, alcohol consumption patterns, and alcohol expectancies. *Personality and Individual Differences, 38*, 337-346. 10.1016/j.paid.2004.04.012.

Vigil, J. M. (2009). A socio-relational framework of sex differences in the expression of emotion. *Behavioral and Brain Sciences, 32*, 375-390. 10.1017/s0140525x09991075.

White, J. W., Smith, P. H., Koss, M. P., & Figueredo, A. J. (2000). Intimate partner aggression: What have we learned? Comment on Archer (2000). *Psychological Bulletin, 126*, 690-696. 10.1037//0033-2909.126.5.690.

Wilson, M., & Daly, M. (1992). Who kills whom in spouse killings? On the exceptional sex ratio of spousal homicides in the United States. *Criminology, 30*, 189-215. doi:10.1111/j.1745-9125.1992.tb01102.x.

Wilson, M., & Daly, M. (1993). An evolutionary psychological perspective on male sexual proprietariness and violence against wives. *Violence and Victims, 8*, 271-294.

CHAPTER FIVE

General Discussion

This thesis began with an overview of sex differences in aggression as a function of the level of risk involved, and the hypothesis that a sex difference in the propensity to tolerate risk might underlie sex differences in aggression. Meta-analysis of measures of impulsivity and risk-taking indicated that sex differences are apparent primarily on inventories that assay risk-taking, and are absent or weak on trait impulsivity measures which do not refer to risk. This suggested that risky impulsivity might be a good candidate for explaining sex differences in aggression. A correlational analysis in a large community sample showed that risky impulsivity is a common cause of aggression and sociosexuality. Finally, in order to investigate the target paradox, the effects of target sex and intimacy on intimate partner aggression were explored in a student sample. The sex-equal rates of aggressive acts between partners appear to be the result of two different processes operating in men and women: In men, the effect appears to be the result of norms prohibiting aggression towards anyone of the female sex, while in women the relative disinhibition appears to be specific to sexual partners. In this final chapter the theoretical implications of the findings from the meta-analysis, and the links between risky impulsivity, same-sex aggression, opposite-sex aggression and sociosexuality, are explored further, and the findings regarding the target paradox are considered in a cross-cultural context.

Sex Differences in Impulsivity: Risk as the Crucial Factor

The results of the meta-analysis in Chapter Two indicate that sex differences in impulsivity are primarily confined to scales which measure an appetite for, or tolerance of, risk. Impulsivity is a many-faceted construct encompassing: aspects of executive function, such as attention shifting and control of motor behaviour; social capacities and preferences, including a tendency to control one's feelings when upset or to rush into solving interpersonal problems; a motivational style, characterised by an appetite for risk; and emotional traits, such as the tendency to respond strongly to reward or to fear punishment. Given such a broad variety of domains, it is unsurprising that sex differences were found in some but not others. From an evolutionary perspective, sex differences are only expected where selection pressures differ between the sexes. Forms of impulsivity which have an affective or motivational component are implicated in the weighting of costs and benefits involved in risky behaviour – such as aggression – where the sexes differ. Sex differences in cognitive forms of impulsivity were not expected because they deal with the control of responses necessary for social living and are equally necessary for both sexes (MacDonald, 2008).

Risky impulsivity as low fear? The results of the meta-analysis show consistent sex differences on measures which assess fearful inhibition of behaviour (e.g. MPQ Harm Avoidance) and those which measure potentially dangerous actions (e.g. SSS Disinhibition or I_7 Venturesomeness). The sex differences in these two types of measure may be closely linked: Campbell proposed that sex differences in fear might underlie sex differences in risky behaviour including aggression (Campbell, 1999, 2006). Developmental theories regarding the aetiology of effortful control also posit that its developmental antecedent is fear, and longitudinal studies suggest a role for fear in the acquisition of behavioural control (Kochanska & Knaack, 2003). Risky impulsivity might, therefore, be a behavioural manifestation of low fear.

Psychometric measures relating to fear suggest greater fear in women than in men. In two large international samples, women report more frequent (Brebner, 2003) and more intense (Brebner, 2003; Fischer & Manstead, 2000) fear. The fear survey schedule (FSS: Wolpe & Lang, 1964) deals with a number of specific phobia-eliciting stimuli and provides a measure of the number of things which invoke a fear response. Women score higher than men on the FSS and this does not appear to be an artefact of gender roles (Arrindell, Kolk, Pickersgill, & Hageman, 1993). Women also score higher than men on Neuroticism (Schmitt, Realo, Voracek, & Allik, 2008), specifically the anxiety facet (Feingold, 1994).

Trait anxiety measures, however, assess what might be called ‘basal’ or ‘tonic’ levels of anxiety rather than ‘phasic’ fearful responses to particular stimuli or events. Fear to specific stimuli can be assessed by measuring startle responses to sudden noise bursts, and women have greater startle reactivity (Kofler, Muller, Reggiani, & Valls-Sole, 2001). Significant correlations between startle habituation (the reduction in magnitude of startle responses after repeated trials) and personality traits of sensation seeking, constraint, and (to a lesser degree) extraversion suggest that low fearfulness – as indexed by faster startle habituation in the central nervous system – may underlie the expression of these traits (LaRowe, Patrick, Curtin, & Kline, 2006). Furthermore, examination of the role of dopamine receptor gene polymorphisms (see ‘*Dopamine receptor gene polymorphisms*’) on novelty seeking suggests that this effect may be mediated by smaller startle responses (Roussos, Giakoumaki, & Bitsios, 2009).

Given that the meta-analysis in Chapter Two suggests that sex differences in impulsivity are based on low-level affective processes, risky impulsivity – on which there is a sex difference – might be expected to show negative correlations with measures of fear. Further work could test this directly using, for example, potentiated startle as a measure of fear. The following section concerns how individual differences in impulsivity might have a genetic basis.

Where Might Individual and Sex Differences in Risky Impulsivity Come From?

Up to this point in the thesis I have not argued for a particular aetiology of individual differences in risky impulsivity, whether biological or environmental. However, I would argue that an individual's level of risky impulsivity – like almost every individual difference about which we have evidence – is likely to be determined by both genetic and environmental factors and a complex interplay between them. The present section briefly reviews evidence that personality traits related to impulsivity have a biological basis and are, to some extent, heritable.

Testosterone and amygdala function. Although there are currently no data on testosterone and risky impulsivity, testosterone correlates positively with measures of sensation seeking and risk-taking (Archer, 2006b) and with Venturesomeness (Aluja & Torrubia, 2004; Coccaro, Beresford, Minar, Kaskow, & Geracioti, 2007; Daitzman & Zuckerman, 1980), each of which incorporates elements of risk-taking. Furthermore, a single administration of testosterone reduces the magnitude of the fear-potentiated startle response (without affecting baseline startle responses) in women (Hermans, Putman, Baas, Koppeschaar, & van Honk, 2006). Testosterone appears to act on unconsciously experienced fear but not self-reported anxiety, which suggests that testosterone has its effects on subcortical, affective, evolutionarily conserved pathways in the brain (van Honk, Peper, & Schutter, 2005).

The role of the amygdala in aversive emotional states, particularly fear, is well established (see LeDoux, 2000, for a review). However, the amygdala also has a role in appetitive emotional states and appears to signal the intensity of both positive and negative emotions (Hamann, 2005). Recent reviews of the evidence on amygdala function suggest that its role is in representing the value (Morrison & Salzman, 2010) and the salience (Adolphs, 2010) of stimuli more generally, with different regions within the amygdala underlying these two functions (Gamer, Zurowski, & Buchel, 2010). Amygdala size has been found to be positively related to sex drive, for example (Baird, Wilson, Bladin, Saling, & Reutens, 2004). Men have greater amygdala volume than women and this is thought to be the result of sex differences in gonadal hormones prenatally (Goldstein et al., 2001). In response to sexual stimuli, men show greater amygdala reactivity than women (Hamann, Herman, Nolan, & Wallen, 2004). Women, on the other hand, show a more diffuse and sustained amygdala response to fear-evoking stimuli (Williams et al., 2005). This suggests that the amygdala might play different roles in male and female emotion.

Women have greater connectivity than men between the amygdala and orbitofrontal cortex (OFC), which means that they have more cortical tissue modulating amygdala activity (Gur, Gunning-Dixon, Bilker, & Gur, 2002). The OFC is associated with sensitivity to reward and punishment (Bechara, Damasio, Damasio, & Anderson, 1994). Damage to the OFC is associated with increased impulsivity (Berlin, Rolls, & Kischka, 2004), and reduced connectivity between the amygdala and the OFC is associated with impulsive aggression (Coccaro, McCloskey, Fitzgerald, & Phan, 2007). Furthermore, an increase in testosterone levels in healthy women has been shown to decrease connectivity between the amygdala and the OFC and increase connectivity between the amygdala and the thalamus (van

Wingen, Mattern, Verkes, Buitelaar, & Fernandez, 2010). Sex differences in amygdala connectivity, mediated by testosterone, might therefore underlie a tendency for women to respond to threatening stimuli with avoidant or inhibitory responses more than men, who may respond with more appetitive responses.

Sex-specific reactions to stress. Stress appears to exaggerate sex differences in impulsive and aggressive behaviour. Stress increases risk-taking on the BART in men, but reduces risk-taking on the same task in women (Lighthall, Mather, & Gorlick, 2009). This indicates that men are more likely to respond to provocation or threatening stimuli with an appetitive response while women are more likely to respond with an avoidant response (see also Hillman, Rosengren, & Smith, 2004). Again, the amygdala and OFC are implicated in this sex difference; women show greater activation of the amygdala than men in response to stress and the amount of amygdala activity appears to be more closely related to OFC activity in women than in men. This suggests that stress is “more likely to activate the emotional and visceral network involved in decision making for women and more likely to activate dorsolateral and medial prefrontal regions in males” (Lighthall et al., 2009, p. 4).

Verona and colleagues report evidence that men respond to stress with increased aggression while women respond to stress with decreased aggression (Verona & Curtin, 2006; Verona & Kilmer, 2007). At present this finding has only been demonstrated for aggression towards same-sex strangers, leaving open the question of how stress might affect aggression towards opposite-sex strangers, or known targets. However, these studies also implicate sex differences in low-level, affective processes: Stress in these studies was indexed by startle response, which as I have noted is also used as a measure of fear. In men, startle was positively correlated with aggression, while in women it was negatively correlated with aggression. Given that projections to and from the amygdala are implicated in the startle response (Davis, 1992), and that there are sex differences in amygdala connectivity (Gur et al., 2002), it might be that sex differences in amygdala connectivity underlie sex-specific responses to fear-eliciting or stressful stimuli.

Dopamine receptor gene polymorphisms. Zuckerman and Kuhlman (2000) argue that dopamine drives impulsive and sensation seeking behaviour. Dopamine is associated with appetitive or approach behaviour in non-human animals (Berridge & Robinson, 1998) and recent evidence strongly suggests trait impulsivity in humans is related to levels of dopamine release in the striatum (Buckholtz et al., 2010) and dopamine receptor density (Buckholtz et al., 2010; Gjedde, Kumakura, Cumming, Linnet, & Moller, 2010).

The dopamine D4 receptor (DRD4) gene is one of the most promising candidates for a genetic precursor of personality (Savitz & Ramesar, 2004). This gene has a number of polymorphisms, two of which have been investigated extensively and which are reported to be in linkage disequilibrium (i.e. their occurrence is not independent). Firstly, there is a 48-base-pair sequence which is repeated between 2 and 11 times, with 4 repeats and 7 repeats being the most common forms of the allele, at least in Western populations (Chen, Burton, Greenberger, & Dmitrieva, 1999). Versions of the allele with 6-8 repeats are classed as long (L-DRD4); versions with 2-5 repeats are short (S-DRD4). Secondly, there is a single-nucleotide polymorphism (Munafo, Yalcin, Willis-Owen, & Flint, 2008). L-DRD4 has been reported to be associated with high novelty seeking (as assessed by the TCI) and high impulsivity (as measured by the KSP) but a recent meta-analysis showed a non-significant effect (Munafo et al., 2008). However, the same meta-analysis reported an association between the single-nucleotide polymorphism and novelty seeking, (but not with the broader construct of Extraversion).

The inconsistent relationship between DRD4 polymorphisms and novelty seeking may be due to the fact that novelty seeking as measured by the TCI is itself a broad construct. Roussos, Giakoumaki and Bitsios (2009) examined more narrowly defined individual differences. Significantly, men who possessed at least one L-DRD4 allele had much smaller startle responses than men with only S-DRD4, while problem-solving processes do not vary between the two groups. This suggests that variation in DRD4 exerts its principal effects on affective components of novelty seeking, such as fear.

Elucidating the effects of DRD4 on impulsivity is likely to be complicated by the wide range of facets of impulsivity, and the fact that DRD4 is likely to affect some but not others. Linkage disequilibrium is also likely to make teasing apart the effects of DRD4 and of other genes difficult. For example, there appears to be an interaction between DRD4 and the gene for another dopamine receptor, DRD2, such that the two have interactive effects on constructs related to impulsivity such as conduct disorder (Beaver et al., 2007) and delay discounting (Eisenberg et al., 2007). However, the above all indicates that individual differences in dopamine uptake are associated with behavioural impulsivity and that such individual differences are heritable.

Serotonin transporter gene polymorphisms. Serotonin, like dopamine, is a neurotransmitter that has been implicated in impulsive behaviour. Low serotonin levels in cerebrospinal fluid (CSF) have been strongly implicated in impulsive aggression (for reviews, see Lesch & Merschdorf, 2000; Strüber, Luck, & Roth, 2008) and suicide attempts (Mann, Stanley, McBride, & McEwen, 1986; Stockmeier et al., 1998). The effects of serotonin on behaviour are complex but one recent hypothesis is that serotonin is part of a system of withdrawal from high stimulation environments which may be (but are not necessarily) dangerous or aversive (Tops, Russo, Boksem, & Tucker, 2009). Serotonin's effects on impulsivity are thought to be mediated by its effects in the raphe nucleus, where serotonin has effects antagonistic to dopamine (Deakin, 2003; Zuckerman, 1994).

The gene which codes for the serotonin transporter has a common polymorphism known as 5-HTTLPR, which has short and long forms. The short form is associated with less efficient functioning of the serotonin system (Bakermans-Kranenburg & van Ijzendoorn, 2008; Heils et al., 1996). This polymorphism has been investigated as a genetic substrate of impulsivity, with inconsistent results (Lesch et al., 1996; Lesch & Merschdorf, 2000). As with investigations of DRD4, this inconsistency is thought to be due to the fact that the personality measures under investigation were broadly defined and varied considerably (Munafo, Clark, & Flint, 2005). However, 5-HTTLPR polymorphisms have been shown to be related to fear conditioning (Garpenstrand, Annas, Ekblom, Oreland, & Fredrikson, 2001), and amygdala connectivity (Pezawas et al., 2005), but not to performance on the stop-signal task (L. Clark et al., 2005).This suggests that 5-HTTLPR polymorphisms are related to affective processes such as fear or the motivation to withdraw, rather than a general ability to inhibit a response.

Sex-specific effects of serotonin. Research into the effects of serotonin and serotonin transporter genes on impulsivity is likely to be complicated by the fact that there are sex differences in serotonin systems in the brain. Although men have higher serotonin production than women (Nishizawa et al., 1997), women have a greater density of binding sites for serotonin (Parsey et al., 2002), particularly in frontal and cingulate cortices (Biver et al., 1996). Furthermore, acute tryptophan depletion (ATD), which reduces serotonin synthesis, has sex-specific effects on mood and behaviour as follows. In women, ATD significantly lowers mood (Walderhaug et al., 2007), producing feelings of depression, tiredness, and withdrawal (Ellenbogen, Young, Dean, Palmour, & Benkelfat, 1996), but it does not affect women's impulsivity as measured by the Continuous Performance Task (Walderhaug, Herman, Magnusson, Morgan, & Landro, 2010; Walderhaug et al., 2007). In contrast, ATD has no significant effects on mood in men (Ellenbogen et al., 1996; Walderhaug et al., 2007), but increases impulsivity as measured by the Continuous Performance Task (Walderhaug et al., 2010; Walderhaug et al., 2007). This suggests that sex differences in serotonergic functioning partly mediate sex differences in impulsivity.

The combination of sex differences in serotonin functioning and the implication of serotonin in impulsive aggression have led some to suggest that serotonin may be an important mediator of sex differences in aggression (Strüber et al., 2008). A population study of aggressiveness, conduct disorder and ADHD symptoms found that carrying the short version of the 5-HTTLPR allele was associated with an increased risk of such behaviours for men, but a decreased risk for women (Cadoret et al., 2003), which provides more evidence that the effects of serotonin on impulsive and aggressive behaviours are strongly modulated by sex.

Interim summary

Sex differences in impulsivity appear to be a function of the extent to which impulsivity carries a degree of risk. Furthermore, sex differences in impulsivity appear to be confined largely to low-level, affective, processes rather than cognitive capabilities. Sex differences are also evident on amygdala reactivity, startle reactivity, and motivational responses to stress. Individual differences in impulsivity have a heritable component and those genetic factors which have been investigated also seem to have effects on low-level processes such as startle reactivity. All of this is consistent with the argument that impulsivity might be an adaptation which facilitates high-risk, high-payoff, competitive strategies; it also suggests that the proximate mechanisms are emotional in nature.

The Role of Impulsivity in Same-Sex and Opposite-Sex Aggression

The data in Chapter Three support the hypothesis that same-sex and opposite-sex aggression share a common proximate mechanism – namely risky impulsivity – which they also share with sociosexuality. Both same-sex and opposite-sex aggression are correlated with sociosexuality. Path analysis indicates that risky impulsivity is a common cause of all three of these forms of risky behaviour. The significant sex difference in risky impulsivity is consistent with the argument that the sex difference in direct aggression is mediated by a sex difference in sensitivity to risk (Campbell, 1999; Daly & Wilson, 1988; Strüber et al., 2008), although the path analysis indicates that risky impulsivity only explains some of the sex difference and other factors must be considered.

The relationship between sex, risky impulsivity, and aggression is not straightforward. Risky impulsivity is positively related to both same-sex and opposite-sex aggression, yet these forms of aggression show sex differences in opposite directions. Same-sex and opposite-sex aggression thus differ between the sexes not only in their rates but also in their relationship to risky impulsivity. Chapter Three presented evidence that risky impulsivity is more strongly related to male-male than female-female aggression, with male-female and female-male aggression having similar relationships to risky impulsivity of an intermediate strength. Previous research has also reported a stronger relationship between impulsivity and aggression for male as opposed to female respondents (Archer & Webb, 2006). In this section I argue that a dyadic approach to aggressive encounters could help to shed light on the role of risky impulsivity in aggression.

A dyadic approach to same-sex and opposite-sex aggression. The present thesis indicates that, in research on aggression, sex should be considered not only as something which varies between individuals, but also as something which has complex effects on both same-sex and opposite-sex social interactions (Anderson, 2005). Human social contact shows spontaneous segregation by sex from early childhood to adulthood (Mehta & Strough, 2009, see also Kramer-Moore, 2010), which means that for each sex the prototypical social encounter is with someone of the same sex. Furthermore, evolutionary accounts of sex differences in emotion expression posit that sex-specific styles of emotion expression are designed to “communicate reciprocity potential with same-sex affiliates” (Vigil, 2009: p. 390): According to this argument, women’s emotion displays are adapted to interacting with other women and gaining nurturance and support (see also Taylor et al., 2000), while men’s are adapted towards signalling dominance towards other men (see also Puts, 2010). Thus, men’s and women’s social behaviour in same-sex social encounters have been shaped by different selection pressures. This could mean that average sex differences in risky impulsivity at an individual level will have synergistic effects in same-sex social encounters. Male-male aggression might be more closely related to impulsivity because conflicts between two men are characterised by higher levels of provocation caused by dominance-signalling emotion displays, with the result that impulse control is more likely to be tested and individual differences in impulsivity have more latitude to affect aggressive behaviour. Conversely, individual differences in impulsivity are less strongly related to aggression in female-female conflicts because, when provocation is low due to greater use of nurturance-eliciting emotion displays, impulse control is less likely to be tested. In a mixed-sex dyad the emotions on display are likely to be more mixed, leading to a relationship between impulsivity and aggression that is stronger than in female-female conflicts but weaker than in male-male conflicts.

Further work. In Chapter Four the links between explosive and defusing non-angry behaviours and direct aggression were briefly discussed. In order to evaluate more completely the progression of angry behaviour from initial conflict to direct aggression, network analysis would be a useful tool to examine the perceived causal links between each form of angry behaviour in same-sex conflicts. It would enable a direct test of the hypothesis that explosive anger expression is likely to be met with escalation while defusing anger expression is more likely to be met with withdrawal. Causal models for men and women could also be examined separately. If both sexes endorse the same causal links – i.e. if explosive actions are more likely to be met with aggression than defusing actions, regardless of who performs them – that would lend support to the hypothesis that the effect of sex on same-sex aggression is mediated by anger expression. Conversely, if the sexes endorse different causal networks – i.e. if the sexes differ in their likelihood of responding to certain acts with aggression – then this would imply that a sex difference in the interpretation of angry behaviour leads to sex differences in same-sex aggression.

The Target Paradox: Cultural, Biological and Dyadic Approaches

When considering partner aggression it is necessary to take into account not only the effects of both the sex of the aggressor and the target, but also the relationship between them. Chapter Four aimed to build on the existing literature on the target paradox in intimate aggression by disentangling the effects of intimacy and sex. The results showed that men lower their aggression towards a partner relative to same-sex targets, but that this lowering of aggression is not specific to partners, rather it applies to any female target. In contrast, women raise their aggression towards a partner relative to same-sex targets. This disinhibition of aggression is specific to partners whether measured by vignette responses or by self-report. In this section I will explore possible cultural and biological factors that could contribute to this pattern, before considering how dyadic processes, as described above, might interact with both of these.

Cultural differences: A social approach to opposite-sex aggression. In Western societies, men's aggression towards women is inhibited because the costs are particularly high, relative to in other societies. Male aggression towards women, far from being normative, is strongly proscribed by social norms: In law, assaulting a female intimate partner is recognised as being a criminal act as much as assaulting any other person. The socially and legally unacceptable nature of male aggression towards women results in third party intervention being a likely response – either from the police or from a friend or relative of the victim. Thus, men are well aware of the high costs of aggressing towards a female partner. Women, in turn, are able to aggress more freely against male partners than they otherwise would. Fear of retaliation is diminished, either because of the knowledge that male retaliation is viewed as unacceptable (Feld & Felson, 2008; Fiebert & Gonzalez, 1997), or because of low-level emotional disinhibition (Campbell, 2008, 2010), or both.

Although some commentators have argued that male violence towards women is normative due to the patriarchal nature of most societies (Dobash & Dobash, 1979), men and women in Western countries view male aggression towards female partners as more serious and less excusable than female aggression towards male partners (Felson & Feld, 2009; Sorenson & Taylor, 2005), or male aggression towards same-sex partners (Harris & Cook, 1994). In two studies from the US, the majority of participants agreed that a woman who is assaulted by her husband or partner should call the police (Felson & Feld, 2009; Sorenson & Taylor, 2005). A Spanish study found that 77% of respondents said they would report a case of domestic violence to the police, and 23% of participants who knew of a case of domestic assault had actually reported it to the police (Gracia & Herrero, 2006). In the US, men who assault intimate partners precipitate more severe legal consequences than men who assault other men (Felson, 2008). In addition to – or perhaps because of – these strong social and legal proscriptions, a norm of chivalry appears to have become very strongly internalised in men and affects their behaviour directly (Davidovic, Bell, Ferguson, Gorski, & Campbell, 2010).

Cross-cultural data are difficult to compare directly and the following is intended to be illustrative rather than comprehensive. Globally, the Western pattern appears to be the exception rather than the norm. Caldwell refers to a ‘patriarchal belt’ encompassing much of Africa, the Middle East and South Asia (Caldwell, 1978, 1980). Although there are differences between the cultures in the ways in which patriarchal values are imposed and their social and economic consequences for women (Kandiyoti, 1988), an acceptance of aggression towards wives seems to be shared throughout. In many such nations, police regard intimate partner aggression as a private problem rather than a criminal one, and cultural norms prohibit women from reporting abuse to the authorities (e.g. C. J. Clark, Silverman, Shahrouri, Everson-Rose, & Groce, 2010; Douki, Nacef, Belhadj, Bouasker, & Ghachem, 2003; Haj-Yahia, 2000, 2002a, 2002b; Hindin, 2003; Ilika, 2005; Saito, Cooke, Creedy, & Chaboyer, 2009). Under Islamic law, for example, a married woman “has no legal right to object to her husband’s exercising his disciplinary authority” (Douki et al., 2003, p. 168): A man’s aggression towards his wife is seen as a right conferred by marriage and its prevention as the responsibility of the wife (Haj-Yahia, 2000, 2002b). In cultures where there is a strong societal emphasis on ‘honour,’ women are expected to tolerate their partners’ aggression and not to report it to authorities (e.g. C. J. Clark et al., 2010).

Patriarchy or male dominance appears likely to have been the norm in preindustrial human societies (Eibl-Eibesfeldt, 1989). Hunter-gatherer societies have high rates of male-perpetrated partner aggression, which is particularly high when women are isolated from their natal kin (Chagnon, 1979). Although the intervention of natal kin when a husband’s violence becomes ‘too severe’ (Chagnon, 1979; see also Ilika, 2005) implies protection of women, it also suggests that third parties will only protect women who are ‘theirs’ and that women have no reason to expect intervention or protection from their wider social group or society as a whole. Thus, male aggression towards partners is not punished automatically because it is non-normative; intervention occurs only where the aggression conflicts with the interests of a particular kinship group. Furthermore, in some societies family intervention consists primarily of instructing the wife to remain in the marriage, modify her behaviour to avoid further victimisation, and refrain from disclosing the problem to anyone outside the family (Haj-Yahia, 1996; Saito et al., 2009).

All of this suggests that, with the exception of modern Western cultures, male violence towards partners is a low-cost strategy. There is little likelihood of punishment from a third party – particularly not the police or state – and it does not violate social norms. In contrast, women's aggression towards partners has extremely high costs: it is non-normative behaviour which carries a very high risk of punishment. Given that a substantial proportion of women and men in many societies believe that a husband is justified in physically attacking his wife if she 'nags' or disobeys him, or refuses to have sex (see, e.g. Boy & Kulczycki, 2008; Haj-Yahia, 2002b), it seems likely that any act of aggression would be met with retaliation. This will serve to inhibit female-perpetrated aggression, and increase the sex difference in intimate partner aggression in non-Western societies (Archer, 2006a).

Data on female aggression towards partners are rare cross-culturally and data on variables which influence women's partner aggression are even rarer. Because sex symmetry in rates of intimate partner aggression is confined to wealthy Western nations, a focus on female victimisation in societies with low empowerment of women is "appropriate in terms of policy issues, though not necessarily in terms of providing a broad and coherent explanation of partner violence" (Archer, 2006a, p. 150). In particular, the lack of data means that we cannot establish how women's levels of aggression towards partners in non-Western nations compare to their levels of aggression towards same-sex targets. However, the evidence to date indicates that both sexes' rates of intimate partner aggression are sensitive to cultural differences – particularly in women's empowerment. For example, a study by

Levinson (cited in Archer, 2006a) showed that in societies where women participate in female-only work groups, they are more likely to aggress towards their partners, as well as being less likely to be victimised (but see Koenig, Ahmed, Hossain, & Mozumder, 2003). This might be the result of greater financial independence, or the presence of a support network of women, or both of these things. Archer argues that the rates of male and female partner aggression are closely linked because women's aggression towards partners is heavily influenced by the perceived likelihood of male retaliation. This, in turn, is determined by social norms and women's position in society.

Future work. Felson (2002) suggests that the norm of chivalry originally arose to protect women who did not have male partners to protect them. He further suggests that male aggression towards women is generally non-normative. Data on perceptions of male aggression towards a woman who is not a wife are lacking: most cross-cultural data focus solely on aggression towards intimate partners. It may be that acceptance of aggression is particular to the "formal reproductive alliance" that is marriage (Daly & Wilson, 1988, p. 187). Western prohibition of male aggression towards partners might result from intimate partner aggression being viewed less as a private issue and more as something which concerns society as a whole, thus bringing norms about male aggression towards female partners in line with norms regarding male aggression towards women more generally (Archer, 2006a). This raises the possibility that, in cultures where aggression towards female partners is considered a private matter, male aggression towards partners might in fact be higher than aggression towards other female targets. This would result in an apparently 'intimacy specific' elevation of aggression towards partners by men. Currently, the author is aware of no dataset that would enable this to be examined.

Future work could usefully examine the effects of intimacy and sex on beliefs about – and use of –aggression cross-culturally.

The Role of Oxytocin in Intimate Partner Aggression

The evidence outlined above explains why the cost-benefit trade-offs involved in intimate partner aggression differ across various cultures for men, which in turn affects the costs and benefits of intimate partner aggression for women. However women's raised aggression towards male partners in Western countries cannot be completely explained by cultural differences in costs and benefits. Recall that the data in Chapter Four show that women's aggression is not disinhibited towards all men: Despite the fact that cultural norms prohibit male retaliation towards any woman and not just intimate partners, women's aggression towards men who are not partners continues to be inhibited – it is only within an intimate partnership that inhibitions are lowered. The mechanism proposed in Chapter Four for facilitating the relationship between intimacy and raised aggression was a partner-specific reduction in fear-based inhibition, mediated by oxytocin.

The evidence regarding the effects of oxytocin on female social behaviour is compatible with the suggestion that a person-specific reduction in fear might cause women to use more aggression towards intimate partners than other targets. Furthermore, this hypothesis dovetails with the argument outlined in Chapter Three that aggressive and sexual behaviour might be mediated by a single underlying mechanism. If a single psychological mechanism is responsible for restraining both sexual and aggressive impulses, then we would expect that situations or contexts which cause one of these kinds of impulse to be uninhibited would also relax the inhibitions on the other kind of impulse. This appears to be the case in women's raised aggression towards intimate partners.

There is some evidence that, in couples that become aggressive, aggression occurs after the onset of sexual activity. For example, Kaestle and Halpern (2005) found that, in the majority of couples where both sexual intercourse and one or more aggressive acts were reported, intercourse preceded the onset of aggression. Cate and colleagues (Cate, Henton, Koval, Christopher, & Lloyd, 1982, p. 83) found that 83% of respondents whose dating partner had aggressed towards them reported that the aggression began after the relationship 'became intimate,' although 'intimate' is not clearly defined. Because oxytocin is released during intercourse and particularly at orgasm, the onset of sexual activity might be accompanied by raised levels of oxytocin which reduce fear and – in women – disinhibit aggression in the case of provocation or anger. The following section describes briefly the proposed role of oxytocin in mediating female partner aggression and how this might interact with cultural factors.

Oxytocin is a peptide hormone synthesised in the hypothalamus (For reviews, see Campbell, 2008; 2010; Heinrichs, von Dawans, & Domes, 2009; Lee, Macbeth, Pagani, & Young, 2009). Campbell (2008, 2010) argues that oxytocin mediates a reduction in fear in response to biologically necessary violations of bodily integrity. For example, sex and childbirth, despite being essential to reproductive success, carry a risk of assault, injury, infection or death. Oxytocin's function in such events is to down-regulate activity of the hypothalamic-pituitary-adrenal (HPA) axis and thereby reduce stress. Oxytocin might facilitate women's aggression towards intimate partners because overcoming fear of one form of bodily encroachment might also result in a reduction in fear of other kinds. In other words, sex with a particular partner represents an over-ride of the fear of bodily encroachment which is specific to that partner. This person-specific reduction in fear might also mediate the raised levels of female aggression within the context of an intimate partnership.

Oxytocin is produced in response to stress in women and evidence for the anxiolytic properties of oxytocin is well established from animal studies and is accumulating in human studies (Campbell, 2008, 2010; Lim & Young, 2006). Oxytocin reduces amygdala activity in men (Domes et al., 2007; Kirsch et al., 2005; Petrovic, Kalisch, Singer, & Dolan, 2008) but results from female samples are lacking. One recent study found a selective *increase* in amygdala activity in response to fearful faces after administration of intranasal oxytocin in women (Domes et al., 2010). However, this increase amygdala reactivity might simply reflect a greater allocation of attentional resources to salient features of the faces, rather than enhanced fear (Pessoa & Adolphs, 2010). Furthermore, the faces in Domes et al.'s study were unfamiliar to the participants. This means that the results cannot tell us how oxytocin would modulate fear of intimate partners. With regard to the role of oxytocin in interpersonal interactions, a recent study found that administration of intranasal oxytocin significantly reduced cortisol levels in couples after a mildly stressful conflict discussion (Ditzen et al., 2009) and there was suggestive evidence that this effect was more pronounced in women than in men.

Sex-specific effects of oxytocin. There are a number of possible reasons why oxytocin does not appear to facilitate partner aggression in men as well as in women. First, oestrogen modulates not only the release and binding of oxytocin (Lim & Young, 2006), but also the rate of transcriptions form the gene coding for the oxytocin transporter (Choleris, Devidze, Kavaliers, & Pfaff, 2008). Thus, oxytocin might have sex-specific effects due to its interaction with gonadal hormones.

Second, the present thesis argues that a reduction in fear is necessary for women to enter into a relationship because of the high costs involved. For men, the costs of entering a sexual relationship are lower – standard parental investment theory predicts that men will be positively eager to pursue mating opportunities – so a reduction in fear is not necessary to facilitate such a partnership. Because a reduction in inhibition is not necessary to enter the relationship, there is no knock-on fear reduction in the domain of aggression: oxytocin therefore would not be expected to facilitate aggression in the same way. Third, if oxytocin reduces stress in both sexes, we would expect it to reduce aggression in men and facilitate it in women, because of the sex-specific effects of stress on aggression that have been demonstrated by Verona and colleagues (Verona & Curtin, 2006; Verona & Kilmer, 2007).

Are the cultural and biological accounts compatible? The cultural account outlined above accounts for variation in male-perpetrated intimate partner aggression across cultures, but does not explain the effects of intimacy on women's relationship aggression. Oxytocin explains why women might become selectively less sensitive to the costs of aggressing towards male partners as opposed to any other male, but does not address cultural differences in the sex difference in intimate partner aggression.

However, one aspect of the present data on cross-cultural aggression that has not yet been discussed is this: even in societies with low gender empowerment and/or where the sex difference in aggression is heavily in the male direction, the rates of female aggression towards partners are not trivial (Archer, 2006a). What can account for a women aggressing towards her partner even when retaliation is likely and she has little access to third-party support or ability to leave the relationship? If, even in cultures where female empowerment is low, women are motivated to aggress against their partners, this suggests that there must be some real or perceived pay-off to doing so. It also suggests that women somehow overcome the fear of retaliation when it is likely that it will be forthcoming and may be serious. Oxytocin appears to facilitate maternal aggression which occurs even when – or perhaps because – fear is high (Campbell, 2008, 2010). Oxytocin might, therefore, make female intimate partner aggression more likely in all cultures; however, what happens next is determined largely by culture. In some cultures, male retaliation is inhibited – either in likelihood, severity, or both – while in others it is not. The likelihood of further female aggression will depend on this.

Future work. Future work could also examine directly the hypothesis of a target-specific reduction in women's fear by using a startle paradigm: if women have smaller startle responses (and/or faster habituation) when viewing pictures of their partner as opposed to viewing pictures of male strangers or friends, then this would provide evidence that intimate partners are associated with a reduction in fear. Because female aggression towards partners is hypothesised to be brought about by this reduction in fear, the magnitude of the reduction in startle reactivity should correlate positively with aggression towards the partner or – more specifically – the difference between aggression towards the partner and aggression towards other male targets.

Establishing the effects of oxytocin on fear-based inhibition is likely to be complicated by a number of factors. First, it might be that oxytocin reduces fear-based inhibition not by reducing amygdala activity but by altering connectivity between the amygdala and cortical structures. Pessoa and Adolphs (2010) have recently argued for a stronger focus on connections between the amygdala and cortex in the study of affective processes. If oxytocin reduces connectivity between the amygdala and OFC in women more than in men, for example, this would mean that women's responses to threatening stimuli mirrored those of men more closely. Second, the effects of oxytocin on aggression might not be the result of a reduction in emotion of fear but instead in the inhibitory effects of fear on behaviour. Maternal aggression, which is thought to be facilitated by oxytocin, occurs not in the absence of fear but in the presence of high levels of fear (Campbell, 2008, 2010). If this is the case, then the effects of oxytocin on fear-based inhibition may be analogous to those of testosterone. Testosterone does not reduce self-reported anxiety but does reduce unconscious effects of fearful stimuli on behaviour in women (van Honk et al., 2005). Future work on the effects of oxytocin could therefore usefully focus on establishing behavioural effects before attempting to uncover the underlying neural and emotional mechanisms.

Is intimate partner aggression adaptive? High male-male aggression is believed to have persisted through evolutionary time despite its high costs because it is adaptive. Evolutionary accounts of intimate partner aggression are framed in terms of adaptive benefits: Although an individual who kills an intimate partner has "clearly overstepped the bounds of utility" (Daly & Wilson, 1988, p. 205), both men and women have something to gain by controlling the behaviour of their partners in a way that reduces the likelihood of infidelity or abandonment. This view is supported by evidence that controlling behaviours are used by both sexes with no sex difference in rates (Buss, 1988; Graham-Kevan & Archer, 2009), although the forms of control used by men and women tend to differ (Felson & Outlaw, 2007).

Controlling behaviours other than aggression are significantly and strongly correlated with intimate partner aggression, and this relationship holds for both sexes

(Felson & Outlaw, 2007; Graham-Kevan & Archer, 2009). Intimate partner aggression might therefore best be seen as part of a suite of tactics aimed at ensuring that an individual's investment in a long-term relationship is matched by a similar – or even higher – level of investment by the partner. Aggression within a relationship does not necessarily lead to its dissolution: the proportion of relationships that end because of aggressive behaviour ranges widely over studies (Sugarman & Hotaling, 1989) but is frequently less than half (Cate et al., 1982; Henton, Cate, Koval, Lloyd, & Christopher, 1983; Roscoe & Benaske, 1985). Some studies report that aggressive acts are seen as a sign of love by many respondents (Henton et al., 1983) and, in the majority of cases where the relationship does not dissolve, relationship satisfaction remains unaltered or actually increases (Sugarman & Hotaling, 1989). It might be that in such relationships aggression does in fact reduce the likelihood of dissolution, thereby serving its intended function even at a cost to either or both partners.

Controlling behaviour has been implicated in male-perpetrated partner violence for a considerable length of time (Daly, Wilson, & Weghorst, 1982; Dobash & Dobash, 1979; Wilson & Daly, 1993), but has only recently been explored as a predictor of intimate partner aggression perpetrated by both sexes (Felson & Outlaw, 2007; Graham-Kevan & Archer, 2009), and cross-cultural data are lacking. The sex-equal rates of controlling behaviour might be a purely Western pattern (Graham-Kevan & Archer, 2009). Low female empowerment might result in women pursuing different types of mate retention tactics which do not involve direct confrontation (Buss, 1988; Buss & Shackelford, 1997).

Partner aggression summary

Evolutionary accounts of intimate partner aggression have traditionally held that it is perpetrated primarily by men as a means of control. However, both sexes have much to lose from the abandonment of a long-term partner (Buss, Larsen, Westen, & Semmelroth, 1992) and much to gain from controlling their behaviour to some extent in order to prevent abandonment. Controlling behaviour does not appear to differ between the sexes and nor does direct aggression, although women are more likely than men to be injured through intimate partner aggression.

The findings of the present thesis suggest that men’s aggression towards intimate partners is inhibited because they are women: their aggression towards female targets is uniformly low regardless of the relationship between them. Women’s aggression towards intimate partners appears to be specifically disinhibited relative to other targets not because the partner is male (although this may result in greater impelling forces) but because they are intimate: women’s aggression towards male targets is lower than aggression towards other women but is raised in the case of partners. Cross-cultural data would be instructive on this as there is currently a dearth of studies dealing specifically with sex differences in intimate partner aggression in non-Western cultures. Oxytocin might mediate a target-specific reduction in fear of intimate partners which would account for this specific increase in aggression. Future work on this must take into account sex-specific effects of oxytocin on brain function and behaviour.

General Summary and Conclusions

This thesis began with the hypothesis that a sex difference in impulsivity might mediate the sex difference in direct aggression and evidence for sex differences in impulsivity was examined. In Chapter Two, meta-analysis of sex differences in extant measures of impulsivity revealed that sex differences are apparent mainly on measures which pertain to risk taking and sensation seeking as opposed to 'general' impulsivity, and low-level, affective processes as opposed to higher-level cognitive processes. In Chapter Three, it was hypothesised that risky impulsivity might underlie a general tendency to tolerate physical risks which might have payoffs in terms of reproductive success. Finally in Chapter Four, the puzzling question of why the sex difference in direct aggression disappears within the context of dating relationships was examined. The results from these three chapters indicate that sex differences in impulsivity are confined to scales incorporate an element of risk-taking, that risky impulsivity is a common cause of aggression and sociosexuality, and that the target paradox in intimate aggression appears to be the result of effects of both intimacy and sex.

Any theory accounting for sex differences in aggression must be able to explain the shift in the sex difference when the target is an intimate partner. To date, theoretical accounts of same-sex aggression and intimate partner aggression have remained largely separate and explanatory accounts of intimate partner aggression have frequently focused only on male-perpetrated aggression. The present results suggest that explanatory accounts are needed for both the male reduction in aggression towards intimate partners and the female increase in aggression towards intimate partners, and that the mechanisms mediating each of these shifts will differ.

With regard to men's inhibition of aggression towards partners, it appears that aggression towards intimate partners is no more or less inhibited than aggression towards any other female target. The specific proximate psychological mechanisms, however, remain unclear: It might be that men's motivation to aggress is reduced when the target is female, that men perceive greater costs when the target is female, or both. Considering the effects of male and female styles of anger expression during conflicts may prove instructive. It might be that the female tendency to use defusing anger expression lessens the tendency towards escalation in mixed-sex as opposed to male-male conflicts. More specifically, reduced provocation might lessen the appetitive motivation to aggress and hence make aggressive impulses easier to control. Further work could also usefully examine beliefs about male aggression towards women generally as well as towards female partners, particularly cross-culturally, as such data are lacking.

With regard to women's aggression, however, I suggest that focusing on the role of fear could prove instrumental in uniting general theories of aggression with accounts of intimate partner aggression. Evidence from Chapter Two of this thesis supports the hypothesis that sex differences in risky, impulsive behaviour might be predicated at a very basic level on sex differences in the readiness to respond to stimuli with fear. There is strong evidence for sex differences in the neural systems underlying fear, and genetic factors associated with impulsivity exert their principal effects on processes related to fear processing such as the startle response. Risky impulsivity might, therefore, be the behavioural manifestation of a stable tendency towards low fear, and the sex difference in risky impulsivity a reflection of a sex difference in fearfulness.

Women's intimate partner aggression appears to be the behavioural manifestation of a specific reduction in fear given certain circumstances. Women's aggression towards men is disinhibited specifically when the target is an intimate partner, and oxytocin has been suggested as a mediating mechanism for this reduction in fear. The evidence in Chapter Three that sexual and aggressive behaviour share common psychological underpinnings supports the argument that the lessening of inhibitions necessary for a sexual relationship to take place might also disinhibit aggressive impulses. Future work on fear responses to threatening faces could examine the effects of viewing an intimate partner's face as opposed to strangers' faces. A specific reduction in fearful responding to a partner's face in women would support the argument outlined above that oxytocin might mediate a target-specific reduction in fear.

To conclude: the present thesis reports evidence that sexual and aggressive behaviour share common psychological underpinnings due to their shared element of risk. Sex differences in risky behaviour in general – and aggression in particular – can be thought of as reflecting a sex difference in the cost-benefit tradeoffs involved in action or inaction. Furthermore, it appears that the cost-benefit tradeoff of aggressive behaviour depends, among other things, on the target of the aggression. For men, the tradeoff is sensitive mainly to the sex of the target, while for women the tradeoff is affected by intimacy. This suggests that the absence of a sex difference in intimate partner aggression in Western samples does not mean that the processes underlying intimate partner aggression are gender free: rather, men and women arrive at a gender-equal rate of aggression via different processes. Any complete theory of sex differences in aggression must take into account sex-specific forms of anger expression and responses to provocation, and dyadic as well as intrapsychic processes.

References

Adolphs, R. (2010). What does the amygdala contribute to social cognition? In *Year in Cognitive Neuroscience 2010* (Vol. 1191, pp. 42-61). Oxford: Blackwell Publishing. 10.1111/j.1749-6632.2010.05445.x.

Aluja, A., & Torrubia, R. (2004). Hostility-aggressiveness, sensation seeking, and sex hormones in men: Re-exploring their relationship. *Neuropsychobiology, 50*, 102-107. 10.1159/000077947.

Anderson, K. L. (2005). Theorizing gender in intimate partner violence research. *Sex Roles, 52*, 853-865. 10.1007/s11199-005-4204-x.

Archer, J. (2006a). Cross-cultural differences in physical aggression between partners: A social-role analysis. *Personality and Social Psychology Review, 10*, 133-153. doi:10.1207/s15327957pspr1002_3.

Archer, J. (2006b). Testosterone and human aggression: an evaluation of the challenge hypothesis. *Neuroscience and Biobehavioral Reviews, 30*, 319-345. 10.1016/j.neubiorev.2004.12.007.

Archer, J., & Webb, I. A. (2006). The relation between scores on the Buss-Perry Aggression Questionnaire and aggressive acts, impulsiveness, competitiveness, dominance, and sexual jealousy. *Aggressive Behavior, 32*, 464-473. doi:10.1002/ab.20146.

Arrindell, W. A., Kolk, A. M., Pickersgill, M. J., & Hageman, W. (1993). Biological sex, sex role orientation, masculine sex role stress, dissimulation and self-reported fears. *Advances in Behaviour Research and Therapy, 15*, 103-146. doi:10.1016/0146-6402(93)90018-W.

Baird, A. D., Wilson, S. J., Bladin, P. F., Saling, M. M., & Reutens, D. C. (2004). The amygdala and sexual drive: Insights from temporal lobe epilepsy surgery. *Annals of Neurology, 55*, 87-96. 10.1002/ana.10997.

Bakermans-Kranenburg, M. J., & van Ijzendoorn, M. H. (2008). Oxytocin receptor (OXTR) and serotonin transporter (5-HTT) genes associated with observed parenting. *Social Cognitive and Affective Neuroscience, 3*, 128-134. 10.1093/scan/nsn004.

Beaver, K. M., Wright, J. P., DeLisi, M., Walsh, A., Vaughn, M. G., Boisvert, D., et al. (2007). A gene x gene interaction between DRD2 and DRD4 is associated with conduct disorder and antisocial behavior in males. *Behavioral and Brain Functions, 3*, 8. 10.1186/1744-9081-3-30.

Bechara, A., Damasio, A. R., Damasio, H., & Anderson, S. W. (1994). Insensitivity to future consequences following damage to human prefrontal cortex. *Cognition, 50*, 7-15.

Berlin, H. A., Rolls, E. T., & Kischka, U. (2004). Impulsivity, time perception, emotion and reinforcement sensitivity in patients with orbitofrontal cortex lesions. *Brain, 127*, 1108-1126. 10.1093/brain/awh135.

Berridge, K. C., & Robinson, T. E. (1998). What is the role of dopamine in reward: hedonic impact, reward learning, or incentive salience? *Brain Research Reviews, 28*, 309-369.

Biver, F., Lotstra, F., Monclus, M., Wikler, D., Damhaut, P., Mendlewicz, J., et al. (1996). Sex difference in 5HT(2) receptor in the living human brain. *Neuroscience Letters, 204*, 25-28.

Boy, A., & Kulczycki, A. (2008). What we know about intimate partner violence in the Middle East and North Africa. *Violence Against Women, 14*, 53-70. 10.1177/1077801207311860.

Brebner, J. (2003). Gender and emotions. *Personality and Individual Differences, 34*, 387-394. doi:10.1016/S0191-8869(02)00059-4.

Buckholtz, J. W., Treadway, M. T., Cowan, R. L., Woodward, N. D., Li, R., Ansari, M. S., et al. (2010). Dopaminergic network differences in human impulsivity. *Science, 329*, 532. doi:10.1126/science.1185778.

Buss, D. M. (1988). From vigilance to violence: Tactics of mate retention in American undergraduates. *Ethology and Sociobiology, 9*, 291-317. doi:10.1016/0162-3095(88)90010-6.

Buss, D. M., Larsen, R. J., Westen, D., & Semmelroth, J. (1992). Sex differences in jealousy: Evolution, physiology, and psychology. *Psychological Science, 3*, 251-255. doi:10.1111/j.1467-9280.1992.tb00038.x.

Buss, D. M., & Shackelford, T. K. (1997). From vigilance to violence: Mate retention tactics in married couples. *Journal of Personality and Social Psychology, 72*, 346-361.

Cadoret, R. J., Langbehn, D., Caspers, K., Troughton, E. P., Yucuis, R., Sandhu, H. K., et al. (2003). Associations of the serotonin transporter promoter polymorphism with aggressivity, attention deficit, and conduct disorder in an adoptee population. *Comprehensive Psychiatry, 44*, 88-101. 10.1053/comp.2003.50018.

Caldwell, J. C. (1978). A Theory of Fertility: From High Plateau to Destabilization. *Population and Development Review, 4*, 553-577. doi:10.2307/1971727.

Caldwell, J. C. (1980). Mass Education as a Determinant of the Timing of Fertility Decline. *Population and Development Review, 6*, 225-255. doi:10.2307/1972729.

Campbell, A. (1999). Staying alive: Evolution, culture, and women's intrasexual aggression. *Behavioral and Brain Sciences, 22*, 203-214+. doi:10.1017/S0140525X99001818.

Campbell, A. (2006). Sex differences in direct aggression: What are the psychological mediators? *Aggression and Violent Behavior, 11*, 237-264. doi:10.1016/j.avb.2005.09.002.

Campbell, A. (2008). Attachment, aggression and affiliation: The role of oxytocin in female social behavior. *Biological Psychology, 77*, 1-10. 10.1016/j.biopsycho.2007.09.001.

Campbell, A. (2010). Oxytocin and human social behavior. *Personality and Social Psychology Review, 14*, 281-295. 10.1177/1088868310363594.

Cate, R. M., Henton, J. M., Koval, J., Christopher, F. S., & Lloyd, S. (1982). Premarital abuse: A social psychological perspective. *Journal of Family Issues, 3*, 79-90. 10.1177/019251382003001006.

Chagnon, N. A. (1979). *Yanomamö: The Fierce People* (3rd ed.). New York: Holt, Rinehart & Winston.

Chen, C. S., Burton, M., Greenberger, E., & Dmitrieva, J. (1999). Population migration and the variation of dopamine D4 receptor (DRD4) allele frequencies around the globe. *Evolution and Human Behavior, 20*, 309-324. doi:10.1016/S1090-5138(99)00015-X.

Choleris, E., Devidze, N., Kavaliers, M., & Pfaff, D. W. (2008). Steroidal/neuropeptide interactions in hypothalamus and amygdala related to social anxiety. In I. D. Neumann & R. Landgraf (Eds.), *Advances in*

Vasopressin and Oxytocin: From Genes to Behaviour to Disease (Vol. 170, pp. 291-303). Amsterdam: Elsevier Science Bv. 10.1016/s0079-6123(08)00424-x.

Clark, C. J., Silverman, J. G., Shahrouri, M., Everson-Rose, S., & Groce, N. (2010). The role of the extended family in women's risk of intimate partner violence in Jordan. *Social Science & Medicine, 70*, 144-151. 10.1016/j.socscimed.2009.09.024.

Clark, L., Roiser, J. P., Cools, R., Rubinsztein, D. C., Sahakian, B. J., & Robbins, T. W. (2005). Stop signal response inhibition is not modulated by tryptophan depletion or the serotonin transporter polymorphism in healthy volunteers: implications for the 5-HT theory of impulsivity. *Psychopharmacology, 182*, 570-578. 10.1007/s00213-005-0104-6.

Coccaro, E. F., Beresford, B., Minar, P., Kaskow, J., & Geracioti, T. (2007). CSF testosterone: Relationship to aggression, impulsivity, and venturesomeness in adult males with personality disorder. *Journal of Psychiatric Research, 41*, 488-492. 10.1016/j.jpsychires.2006.04.009.

Coccaro, E. F., McCloskey, M. S., Fitzgerald, D. A., & Phan, K. L. (2007). Amygdala and orbitofrontal reactivity to social threat in individuals with impulsive aggression. *Biological Psychiatry, 62*, 168-178. 10.1016/j.biopsych.2006.08.024.

Daitzman, R., & Zuckerman, M. (1980). Disinhibitory sensation seeking, personality and gonadal hormones. *Personality and Individual Differences, 1*, 103-110. doi:10.1016/0191-8869(80)90027-6.

Daly, M., & Wilson, M. (1988). *Homicide*. New York: Aldine de Gruyter.

Daly, M., Wilson, M., & Weghorst, S. J. (1982). Male sexual jealousy. *Ethology and Sociobiology, 3*, 11-27. doi:10.1016/0162-3095(82)90027-9.

Davidovic, A., Bell, K., Ferguson, C., Gorski, E., & Campbell, A. (2010). Impelling and inhibitory forces in aggression: Sex-of-target and relationship effects. *Journal of Interpersonal Violence*, First published online December 2010. doi: 2010.1177/0886260510390953.

Davis, M. (1992). The role of the amygdala in fear and anxiety. *Annual Review of Neuroscience, 15*, 353-375. doi:10.1146/annurev.neuro.15.1.353.

Deakin, J. F. W. (2003). Depression and antisocial personality disorder: two contrasting disorders of 5HT function. *Journal of Neural Transmission-Supplement*, 79-93.

Ditzen, B., Schaer, M., Gabriel, B., Bodenmann, G., Ehlert, U., & Heinrichs, M. (2009). Intranasal Oxytocin Increases Positive Communication and Reduces Cortisol Levels During Couple Conflict. *Biological Psychiatry, 65*, 728-731. 10.1016/j.biopsych.2008.10.011.

Dobash, R. E., & Dobash, R. P. (1979). *Violence against wives: A case against the patriarchy.* New York: Free Press.

Domes, G., Heinrichs, M., Glascher, J., Buchel, C., Braus, D. F., & Herpertz, S. C. (2007). Oxytocin attenuates amygdala responses to emotional faces regardless of valence. *Biological Psychiatry, 62*, 1187-1190. 10.1016/j.biopsych.2007.03.025.

Domes, G., Lischke, A., Berger, C., Grossmann, A., Hauenstein, K., Heinrichs, M., et al. (2010). Effects of intranasal oxytocin on emotional face processing in women. *Psychoneuroendocrinology, 35*, 83-93. 10.1016/j.psyneuen.2009.06.016.

Douki, S., Nacef, F., Belhadj, A., Bouasker, A., & Ghachem, R. (2003). Violence against women in Arab and Islamic countries. *Archives of Women's Mental Health, 6*, 165-171.

Eibl-Eibesfeldt, I. (1989). *Human Ethology*. New York: Aldine de Gruyter.

Eisenberg, D. T. A., MacKillop, J., Modi, M., Beauchemin, J., Dang, D., Lisman, S. A., et al. (2007). Examining impulsivity as an endophenotype using a behavioral approach: a DRD2 TaqI A and DRD4 48-bp VNTR association study. *Behavioral and Brain Functions, 3*, 14. 10.1186/1744-9081-3-2.

Ellenbogen, M. A., Young, S. N., Dean, P., Palmour, R. M., & Benkelfat, C. (1996). Mood response to acute tryptophan depletion in healthy volunteers: Sex differences and temporal stability. *Neuropsychopharmacology, 15*, 465-474.

Feingold, A. (1994). Gender differences in personality: A meta-analysis. *Psychological Bulletin, 116*, 429-456. doi:10.1037/0033-2909.116.3.429.

Feld, S. L., & Felson, R. B. (2008). Gender norms and retaliatory violence against spouses and acquaintances. *Journal of Family Issues, 29*, 692-703. 10.1177/0192513x07312093.

Felson, R. B. (2002). *Violence and gender reexamined*. Washington, D.C.: American Psychological Association.

Felson, R. B. (2008). The legal consequences of intimate partner violence for men and women. *Children and Youth Services Review, 30*, 639-646. 10.1016/j.childyouth.2008.01.005.

Felson, R. B., & Feld, S. L. (2009). When a man hits a woman: Moral evaluations and reporting violence to the police. *Aggressive Behavior, 35*, 477-488. 10.1002/ab.20323.

Felson, R. B., & Outlaw, M. C. (2007). The control motive and marital violence. *Violence and Victims, 22*, 387-407.

Fiebert, M. S., & Gonzalez, D. M. (1997). College women who initiate assaults on their male partners and the reasons offered for such behavior. *Psychological Reports, 80*, 583-590.

Fischer, A. H., & Manstead, A. S. R. (2000). The relation between gender and emotions in different cultures. In A. H. Fischer (Ed.), *Gender and Emotion*. Cambridge: Cambridge University Press.

Gamer, M., Zurowski, B., & Buchel, C. (2010). Different amygdala subregions mediate valence-related and attentional effects of oxytocin in humans. *Proceedings of the National Academy of Sciences of the United States of America, 107*, 9400-9405. 10.1073/pnas.1000985107.

Garpenstrand, H., Annas, P., Ekblom, J., Oreland, L., & Fredrikson, M. (2001). Human fear conditioning is related to dopaminergic and serotonergic biological markers. *Behavioral Neuroscience, 115*, 358-364. 10.1037//0735-7044.115.2.358.

Gjedde, A., Kumakura, Y., Cumming, P., Linnet, J., & Moller, A. (2010). Inverted-U-shaped correlation between dopamine receptor availability in striatum and sensation seeking. *Proceedings of the National Academy of Sciences of the United States of America, 107*, 3870-3875. 10.1073/pnas.0912319107.

Goldstein, J. M., Seidman, L. J., Horton, N. J., Makris, N., Kennedy, D. N., Caviness, V. S., et al. (2001). Normal sexual dimorphism of the adult human brain assessed by in vivo magnetic resonance imaging. *Cerebral Cortex, 11*, 490-497. doi:10.1093/cercor/11.6.490.

Gracia, E., & Herrero, J. (2006). Public attitudes toward reporting partner violence against women and reporting behavior. *Journal of Marriage and the Family, 68*, 759-768.

Graham-Kevan, N., & Archer, J. (2009). Control tactics and partner violence in heterosexual relationships. *Evolution and Human Behavior, 30*, 445-452. 10.1016/j.evolhumbehav.2009.06.007.

Gur, R. C., Gunning-Dixon, F., Bilker, W. B., & Gur, R. E. (2002). Sex differences in temporo-limbic and frontal brain volumes of healthy adults. *Cerebral Cortex, 12*, 998-1003. doi:10.1093/cercor/12.9.998.

Haj-Yahia, M. M. (1996). Wife abuse in the Arab society in Israel. In J. L. Edelson & Z. Eisikovits (Eds.), *Future interventions with battered women and their families*. Thousand Oaks, CA: Sage.

Haj-Yahia, M. M. (2000). Wife abuse and battering in the sociocultural context of Arab society. *Family Process, 39*, 237-255.

Haj-Yahia, M. M. (2002a). Attitudes of Arab women toward different patterns of coping with wife abuse. *Journal of Interpersonal Violence, 17*, 721-745.

Haj-Yahia, M. M. (2002b). Beliefs of Jordanian women about wife-beating. *Psychology of Women Quarterly, 26*, 282-291.

Hamann, S. (2005). Sex differences in the responses of the human amygdala. *Neuroscientist, 11*, 288-293. 10.1077/1073858404271981.

Hamann, S., Herman, R. A., Nolan, C. L., & Wallen, K. (2004). Men and women differ in amygdala response to visual sexual stimuli. *Nature Neuroscience, 7*, 411-416. 10.1038/nn1208.

Harris, R. J., & Cook, C. A. (1994). Attributions about spouse abuse: It matters who the batterers and victims are. *Sex Roles, 30*, 553-565. doi:10.1007/BF01420802.

Heils, A., Teufel, A., Petri, S., Stober, G., Riederer, P., Bengel, D., et al. (1996). Allelic variation of human serotonin transporter gene expression. *Journal of Neurochemistry, 66*, 2621-2624. doi:10.1046/j.1471-4159.1996.66062621.x.

Heinrichs, M., von Dawans, B., & Domes, G. (2009). Oxytocin, vasopressin, and human social behavior. *Frontiers in Neuroendocrinology, 30*, 548-557. 10.1016/j.yfrne.2009.05.005.

Henton, J., Cate, R., Koval, J., Lloyd, S., & Christopher, S. (1983). Romance and violence in dating relationships. *Journal of Family Issues, 4*, 467-482. doi:10.1177/019251383004003004.

Hermans, E. J., Putman, P., Baas, J. M., Koppeschaar, H. P., & van Honk, J. (2006). A single administration of testosterone reduces fear-potentiated startle in humans. *Biological Psychiatry, 59*, 872-874. doi:10.1016/j.biopsych.2005.11.015.

Hillman, C. H., Rosengren, K. S., & Smith, D. P. (2004). Emotion and motivated behavior: postural adjustments to affective picture viewing. *Biological Psychology, 66*, 51-62. 10.1016/j.biopsycho.2003.07.005.

Hindin, M. J. (2003). Understanding women's attitudes towards wife beating in Zimbabwe. *Bulletin of the World Health Organization, 81*, 501-508.

Ilika, A. L. (2005). Women's perception of partner violence in a rural Igbo community. *African Journal of Reproductive Health, 9*, 77-88. doi:10.2307/3583414.

Kaestle, C. E., & Halpern, C. T. (2005). Sexual intercourse precedes partner violence in adolescent romantic relationships. *Journal of Adolescent Health, 36*, 386-392. 10.1016/j.jadohealth.2004.02.030.

Kandiyoti, D. (1988). Bargaining with patriarchy. *Gender & Society, 2*, 274-290. doi:10.1177/089124388002003004.

Kirsch, P., Esslinger, C., Chen, Q., Mier, D., Lis, S., Siddhanti, S., et al. (2005). Oxytocin modulates neural circuitry for social cognition and fear in humans. *Journal of Neuroscience, 25*, 11489-11493. 10.1523/jneurosci.3984-05.2005.

Kochanska, G., & Knaack, A. (2003). Effortful control as a personality characteristic of young children: Antecedents, correlates, and consequences. *Journal of Personality, 71*, 1087-1112.

Koenig, M. A., Ahmed, S., Hossain, M. B., & Mozumder, A. (2003). Women's status and domestic violence in rural Bangladesh: Individual- and community-level effects. *Demography, 40*, 269-288. doi:10.1353/dem.2003.0014.

Kofler, M., Muller, J., Reggiani, L., & Valls-Sole, J. (2001). Influence of gender on auditory startle responses. *Brain Research, 921*, 206-210. doi:10.1016/S0006-8993(01)03120-1.

Kramer-Moore, D. (2010). Asymmetrical clustering by sex in free-forming groups: An observational field study. *Psychological Reports, 107*, 245-250. 10.2466/07.19.21.pr0.107.4.245-250.

LaRowe, S. D., Patrick, C. J., Curtin, J. J., & Kline, J. P. (2006). Personality correlates of startle habituation. *Biological Psychology, 72*, 257-264. doi:10.1016/j.biopsycho.2005.11.008.

LeDoux, J. E. (2000). Emotion circuits in the brain. *Annual Review of Neuroscience, 23*, 155-184.

Lee, H. J., Macbeth, A. H., Pagani, J. H., & Young, W. S. (2009). Oxytocin: The great facilitator of life. *Progress in Neurobiology, 88*, 127-151. 10.1016/j.pneurobio.2009.04.001.

Lesch, K. P., Bengel, D., Heils, A., Sabol, S. Z., Greenberg, B. D., Petri, S., et al. (1996). Association of anxiety-related traits with a polymorphism in the serotonin transporter gene regulatory region. *Science, 274*, 1527-1531.

Lesch, K. P., & Merschdorf, U. (2000). Impulsivity, aggression, and serotonin: A molecular psychobiological perspective. *Behavioral Sciences & the Law, 18*, 581-604. doi:10.1002/1099-0798(200010)18:5<581::AID-BSL411>3.3.CO;2-C.

Lighthall, N. R., Mather, M., & Gorlick, M. A. (2009). Acute Stress Increases Sex Differences in Risk Seeking in the Balloon Analogue Risk Task. *Plos One, 4*, 6. e6002

10.1371/journal.pone.0006002.

Lim, M. M., & Young, L. J. (2006). Neuropeptidergic regulation of affiliative behavior and social bonding in animals. *Hormones and Behavior, 50*, 506-517. doi:10.1016/j.yhbeh.2006.06.028.

MacDonald, K. B. (2008). Effortful Control, Explicit Processing, and the Regulation of Human Evolved Predispositions. *Psychological Review, 115*, 1012-1031. 10.1037/a0013327.

Mann, J. J., Stanley, M., McBride, P. A., & McEwen, B. S. (1986). Increased serotonin-2 and beta-adrenergic-receptor binding in the frontal cortices of suicide victims. *Archives of General Psychiatry, 43*, 954-959.

Mehta, C. M., & Strough, J. (2009). Sex segregation in friendships and normative contexts across the life span. *Developmental Review, 29*, 201-220. 10.1016/j.dr.2009.06.001.

Morrison, S. E., & Salzman, C. D. (2010). Re-valuing the amygdala. *Current Opinion in Neurobiology, 20*, 221-230. 10.1016/j.conb.2010.02.007.

Munafo, M. R., Clark, T., & Flint, J. (2005). Does measurement instrument moderate the association between the serotonin transporter gene and anxiety-related personality traits? A meta-analysis. *Molecular Psychiatry, 10*, 415-419. 10.1038/sj.mp.4001627.

Munafo, M. R., Yalcin, B., Willis-Owen, S. A., & Flint, J. (2008). Association of the dopamine D4 receptor (DRD4) gene and approach-related personality traits: Meta-analysis and new data. *Biological Psychiatry, 63*, 197-206. 10.1016/j.biopsych.2007.04.006.

Nishizawa, S., Benkelfat, C., Young, S. N., Leyton, M., Mzengeza, S., DeMontigny, C., et al. (1997). Differences between males and females in rates of serotonin synthesis in human brain. *Proceedings of the National Academy of Sciences of the United States of America, 94*, 5308-5313.

Parsey, R. V., Oquendo, M. A., Simpson, N. R., Ogden, R. T., Van Heertum, R., Arango, V., et al. (2002). Effects of sex, age, and aggressive traits in man on brain serotonin 5-HT1A receptor binding potential measured by PET using [C-11]WAY-100635. *Brain Research, 954*, 173-182.

Pessoa, L., & Adolphs, R. (2010). Emotion processing and the amygdala: from a 'low road' to 'many roads' of evaluating biological significance. *Nature Reviews Neuroscience, 11*, 773-782. 10.1038/nrn2920.

Petrovic, P., Kalisch, R., Singer, T., & Dolan, R. J. (2008). Oxytocin attenuates affective evaluations of conditioned faces and amygdala activity. *Journal of Neuroscience, 28*, 6607-6615. 10.1523/jneurosci.4572-07.2008.

Pezawas, L., Meyer-Lindenberg, A., Drabant, E. M., Verchinski, B. A., Munoz, K. E., Kolachana, B. S., et al. (2005). 5-HTTLPR polymorphism impacts human cingulate-amygdala interactions: a genetic susceptibility mechanism for depression. *Nature Neuroscience, 8*, 828-834. 10.1038/nn1463.

Puts, D. A. (2010). Beauty and the beast: Mechanisms of sexual selection in humans. *Evolution and Human Behavior, 31*, 157-175. 10.1016/j.evolhumbehav.2010.02.005.

Roscoe, B., & Benaske, N. (1985). Courtship Violence Experienced by Abused Wives: Similarities in Patterns of Abuse. *Family Relations, 34*, 419-424. doi:10.2307/583582.

Roussos, P., Giakoumaki, S. G., & Bitsios, P. (2009). Cognitive and emotional processing in high novelty seeking associated with the L-DRD4 genotype. *Neuropsychologia, 47*, 1654-1659. 10.1016/j.neuropsychologia.2009.02.005.

Saito, A. S., Cooke, M., Creedy, D. K., & Chaboyer, W. (2009). Thai women's experience of intimate partner violence during the perinatal period: A case study analysis. *Nursing & Health Sciences, 11*, 382-387. 10.1111/j.1442-2018.2009.00472.x.

Savitz, J. B., & Ramesar, R. S. (2004). Genetic variants implicated in personality: A review of the more promising candidates. *American Journal of Medical Genetics Part B-Neuropsychiatric Genetics, 131B*, 20-32. 10.1002/ajmg.b.20155.

Schmitt, D. P., Realo, A., Voracek, M., & Allik, J. (2008). Why can't a man be more like a woman? Sex differences in big five personality traits across 55 cultures. *Journal of Personality and Social Psychology, 94*, 168-182. 10.1037/0022-3514.94.1.168.

Sorenson, S. B., & Taylor, C. A. (2005). Female aggression toward male intimate partners: An examination of social norms in a community-based sample. *Psychology of Women Quarterly, 29*, 78-96. doi:10.1111/j.1471-6402.2005.00170.x.

Stockmeier, C. A., Shapiro, L. A., Dilley, G. E., Kolli, T. N., Friedman, L., & Rajkowska, G. (1998). Increase in serotonin-1A autoreceptors in the midbrain of suicide victims with major depression - Postmortem evidence for decreased serotonin activity. *Journal of Neuroscience, 18*, 7394-7401.

Strüber, D., Luck, M., & Roth, G. (2008). Sex, aggression and impulse control: An integrative account. *Neurocase, 14*, 93-121. 10.1080/13554790801992743.

Sugarman, D. B., & Hotaling, G. T. (1989). Dating violence: Prevalence, context, and risk markers. In M. A. Pirog-Good & J. E. Stets (Eds.), *Violence in dating relationships*. New York: Praeger.

Taylor, S. E., Klein, L. C., Lewis, B. P., Gruenewald, T. L., Gurung, R. A. R., & Updegraff, J. A. (2000). Biobehavioral responses to stress in females: Tend-and-befriend, not fight-or-flight. *Psychological Review, 107*, 411-429.

Tops, M., Russo, S., Boksem, M. A. S., & Tucker, D. M. (2009). Serotonin: Modulator of a drive to withdraw. *Brain and Cognition, 71*, 427-436. 10.1016/j.bandc.2009.03.009.

van Honk, J., Peper, J. S., & Schutter, D. (2005). Testosterone reduces unconscious fear but not consciously experienced anxiety: Implications for the disorders of fear and anxiety. *Biological Psychiatry, 58*, 218-225. 10.1016/j.biopsych.2005.04.003.

van Wingen, G., Mattern, C., Verkes, R. J., Buitelaar, J., & Fernandez, G. (2010). Testosterone reduces amygdala-orbitofrontal cortex coupling. *Psychoneuroendocrinology, 35*, 105-113. 10.1016/j.psyneuen.2009.09.007.

Verona, E., & Curtin, J. J. (2006). Gender differences in the negative affective priming of aggressive behavior. *Emotion, 6*, 115-124. 10.1037/1528-3542.6.1.115.

Verona, E., & Kilmer, A. (2007). Stress exposure and affective modulation of aggressive behavior in men and women. *Journal of Abnormal Psychology, 116*, 410-421. 10.1037/0021-843x.116.2.410.

Vigil, J. M. (2009). A socio-relational framework of sex differences in the expression of emotion. *Behavioral and Brain Sciences, 32*, 375-390. 10.1017/s0140525x09991075.

Walderhaug, E., Herman, A. I., Magnusson, A., Morgan, M. J., & Landro, N. I. (2010). The short (S) allele of the serotonin transporter polymorphism and acute tryptophan depletion both increase impulsivity in men. *Neuroscience Letters, 473*, 208-211. 10.1016/j.neulet.2010.02.048.

Walderhaug, E., Magnusson, A., Neumeister, A., Lappalainen, J., Lunde, H., Refsum, H., et al. (2007). Interactive effects of sex and 5-HTTLPR on mood and impulsivity during tryptophan depletion in healthy people. *Biological Psychiatry, 62*, 593-599. 10.1016/j.biopsych.2007.02.012.

Williams, L. M., Barton, M. J., Kemp, A. H., Liddell, B. J., Peduto, A., Gordon, E., et al. (2005). Distinct amygdala-autonomic arousal profiles in response to fear signals in healthy males and females. *Neuroimage, 28*, 618-626.

Wilson, M., & Daly, M. (1993). An evolutionary psychological perspective on male sexual proprietariness and violence against wives. *Violence and Victims, 8*, 271-294.

Wolpe, J., & Lang, P. J. (1964). A Fear Survey Schedule for Use in Behavior-Therapy. *Behaviour Research and Therapy, 2*, 27-30.

Zuckerman, M. (1994). *Behavioral expressions and biosocial bases of sensation seeking*. Cambridge: Cambridge University Press.

Zuckerman, M., & Kuhlman, D. M. (2000). Personality and risk-taking: common biosocial factors. *Journal of Personality, 68*, 999-1029. doi:10.1111/1467-6494.00124.

Appendix A

Effect sizes included in the meta-analysis by study, category and domain.

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Acheson et al (2007)	B	0_a		10	10	4	1	0	1	1	3
Acheson et al (2007)	B	0_a		10	10	4	1	0	1	1	15
Acheson et al (2007)	B	0_a		10	10	4	1	0	1	1	39
Aklin et al (2005)	B	0.22		26	25	1	1	0	1	1	3
Aklin et al (2005)	B	0.20		26	25	1	1	0	1	1	27
Allen et al (1998)	B	0_a		16	10	4	1	0	1	1	15
Baker et al (2003)	B	-0.31		51	39	5	1	0	1	1	15
Bare (2006)	B	-0.41		41	51	4	1	0	0	0	3
Bare (2006)	B	0.24		41	51	4	1	0	0	0	3
Berlin et al (2005)	B	0.61	2.21	10	29	6	0	0	1	1	38
Berlin et al (2005)	B	0.03	1.51	10	29	6	0	0	1	1	38
Berlin et al (2005)	B	-0.34	0.60	10	29	6	0	0	1	1	38
Berlin et al (2005)	B	-0.11	0.47	10	29	6	0	0	1	1	38

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Bjork et al (2004)	B	0.32		27	14	5	1	0	1	1	15
Brown et al (2006)	B	0_a		21	37	6	0	0	1	1	39
Casillas (2006)	B	0.26		84	125	4	1	0	1	0	27
Casillas (2006)	B	-0.35		84	125	4	1	0	1	0	38
Casillas (2006)	B	-0.47		84	125	4	1	0	1	0	39
Casillas (2006)	B	-0.04		84	125	4	1	0	1	0	39
Casillas (2006)	B	-0.24		84	125	4	1	0	1	0	39
Clark et al (2005)	B	-0.20	2.97	27	13	4	1	1	1	1	39
Clark et al (2005)	B	-0.16	0.12	27	13	4	1	1	1	1	39
Davis et al (2007)	B	0_a		81	164	5	0	0	1	1	27
de Wit et al (2007)	B	-0.21	1.41	303	303	6	0	0	1	1	15
de Wit et al (2002)	B	0_a		18	18	4	0	0	2	1	15
de Wit et al (2002)	B	0_a		18	18	4	0	0	2	1	15
de Wit et al (2002)	B	0_a		18	18	4	0	0	2	1	39
de Wit et al (2002)	B	0_a		18	18	4	0	0	2	1	39

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Enticott et al (2006)	B	0.56	2.82	14	17	5	1	1	1	1	39
Enticott et al (2006)	B	-0.36	0.67	14	17	5	1	1	1	1	39
Enticott et al (2006)	B	-0.17	0.62	14	17	5	1	1	1	1	39
Enticott et al (2006)	B	0.24	1.89	14	17	5	1	1	1	1	39
Enticott et al (2006)	B	-0.11	1.00	14	17	5	1	1	1	1	39
Epstein, Erkanli, et al (2003)	B	0.66	0.97	84	94	1	1	0	3	1	39
Epstein, Erkanli, et al (2003)	B	0.64	0.72	98	97	2	1	0	3	1	39
Epstein, Erkanli, et al (2003)	B	0.76	0.67	115	89	1	1	0	3	1	39
Epstein, Richards, et al (2003)	B	0.11		32	46	5	1	0	1	1	15
Epstein, Richards, et al (2003)	B	0.31		32	46	5	1	0	1	1	15
Feldman (1999)	B	-0.47		92	108	3	1	0	0	0	38
Feldman (1999)	B	-0.44		92	108	3	1	0	0	0	38
Feldman (1999)	B	0		92	108	3	1	0	0	0	38
Feldman (1999)	B	0		92	108	3	1	0	0	0	39
Gargallo (1993)	B	0.06	1.07	107	94	1	1	1	3	1	38

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Gargallo (1993)	B	0	0.82	107	94	1	1	1	3	1	38
Goudriaan et al (2007)	B	0[a]		100	100	3	0	0	0	1	27
Heerey et al (2007)	B	-0.60	0.69	12	17	6	0	1	1	1	15
Herba et al (2006)	B	-0.47	1.32	29	28	2	0	1	3	1	39
Herba et al (2006)	B	0.07	0.66	29	28	2	0	1	3	1	39
Herba et al (2006)	B	-0.08	0.39	29	28	2	0	1	3	1	39
Herba et al (2006)	B	-0.06	1.78	28	28	2	0	1	3	1	39
Herba et al (2006)	B	0.22	1.42	28	28	2	0	1	3	1	39
Hunt et al (2005)	B	0.52	1.23	22	58	3	0	0	0	1	3
Johnson et al (2007)	B	-0.10	1.65	17	13	5	1	0	1	1	15
Johnson et al (2007)	B	0.66	1.63	17	13	5	1	0	1	1	15
Johnson et al (2007)	B	-0.04	1.28	17	13	5	1	0	1	1	15
Johnson et al (2007)	B	0.71	1.19	17	13	5	1	0	1	1	15
Johnson et al (2007)	B	0.41	1.07	17	13	5	1	0	1	1	15
Johnson et al (2007)	B	0.24	0.98	17	13	4	1	0	1	1	15

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Johnson et al (2007)	B	-0.23	0.81	17	13	5	1	0	1	1	15
Johnson et al (2007)	B	-0.14	0.38	17	13	4	1	0	1	1	15
Johnson et al (2007)	B	-0.37	0.29	17	13	4	1	0	1	1	15
Jollant et al (2005)	B	0_a		41	41	0	1	1	1	1	27
Keilp et al (2005)	B	0_a		21	37	5	1	0	1	1	39
Kirby & Petry (2004)	B	0.02	1.27	33	27	5	1	0	1	1	15
Kirby et al (2002)	B	-0.23		72.5	72.5	0	1	0	1	1	15
Kirby et al (2002)	B	-0.16		72.5	72.5	0	1	0	1	1	15
Kirby et al (2002)	B	-0.17		73	81	3	1	0	0	1	15
Kollins (2003)	B	0_a		14	28	3	1	0	0	1	15
Lejuez et al (2002)	B	0.63		43	43	3	1	0	1	1	3
Lejuez et al (2003)	B	0.47		30	30	3	1	0	0	1	3
Lejuez et al (2003)	B	0.49		30	30	3	1	0	0	1	3
Lejuez et al (2003)	B	0.68		30	30	3	1	0	0	1	3
Lejuez et al (2003)	B	-0.72		30	30	3	1	0	0	1	27

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Lejuez et al (2003)	B	-0.68		30	30	3	1	0	0	1	27
Lejuez et al (2003)	B	-0.49		30	30	3	1	0	0	1	27
Leshem & Glicksohn (2007)	B	0[a]		59	123	0	1	2	3	1	38
Leshem & Glicksohn (2007)	B	0[a]		59	123	0	1	2	3	1	38
Leshem & Glicksohn (2007)	B	0[a]		59	123	0	1	2	3	1	38
Leshem & Glicksohn (2007)	B	0[a]		59	123	0	1	2	3	1	38
Maras et al (2006)	B	0.64		29	27	1	0	1	3	1	3
Marczinski et al (2007)	B	0[a]		16	16	4	0	0	0	1	39
Mcleish & Oxoby (2007)	B	-0.43	1.16	50	32	3	0	0	0	1	15
Mcleish & Oxoby (2007)	B	-0.59	0.77	50	32	3	0	0	0	1	15
Mcleish & Oxoby (2007)	B	0.14	0.59	50	32	3	0	0	0	1	15
Overman et al (2004)	B	0.35		240	240	0	1	0	2	1	27
Paaver et al (2007)	B	-0.07	1.35	222	261	2	0	1	1	1	38
Petry et al (2002)	B	0.61		32	32	4	0	0	1	1	15
Quiroga et al (2007)	B	0.02		984	668	4	0	1	1	1	38

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Quiroga et al (2007)	B	-0.79	0.48	984	668	4	0	1	1	1	38
Reynolds (2003)	B	0_a		35	40	2	1	0	3	0	15
Reynolds et al (2004)	B	0_a		29	25	3	1	0	1	1	15
Reynolds et al (2004)	B	0_a		29	25	3	1	0	1	1	15
Reynolds, Ortengren, et al (2006)	B	0_a		35	35	4	1	0	1	1	3
Reynolds, Ortengren, et al (2006)	B	-0.26	1.24	35	35	4	1	0	1	1	15
Reynolds, Ortengren, et al (2006)	B	0_a		35	35	4	1	0	1	1	39
Reynolds, Ortengren, et al (2006)	B	0_a		35	35	4	1	0	1	1	39
Reynolds, Richards, et al (2006)	B	0.19	2.20	11	13	4	1	0	1	1	3
Reynolds, Richards, et al (2006)	B	0.24	0.28	11	13	4	1	0	1	1	15
Reynolds, Richards, et al (2006)	B	-0.12	1.77	11	13	4	1	0	1	1	39
Reynolds, Richards, et al (2006)	B	-0.41	0.38	11	13	4	1	0	1	1	39
Stoltenberg et al (2006)	B	0.11	0.85	80	98	4	1	0	0	1	39
Taylor (2005)	B	-0.03	1.72	50	73	0	0	0	0	1	39
Tinius (2003)	B	0_a		19	22	0	1	0	1	1	39

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Walderhaug (2007)	B	0_a		39	44	4	1	1	1	1	39
White et al (2007)	B	0.18	0.96	18	19	4	0	0	1	1	3
Abramowitz & Berenbaum (2007)	GI	-0.14		66	123	3	0	0	0	1	29
Adams et al (1997)	GI	0.07	1.19	420	489	1	0	0	2	1	10
Aidman & Kollaras-Mitsinikos (2006)	GI	-0.11	0.32	10	14	5	1	1	1	1	4
Aklin et al (2005)	GI	-0.10		26	25	1	1	0	1	1	4
Alexander et al (2004)	GI	0.47	0.98	82	87	2	0	1	0	1	10
Allen et al (1998)	GI	0_a		16	10	4	1	0	1	1	4
Allen et al (1998)	GI	0_a		16	10	4	1	0	1	1	10
Allen et al (1998)	GI	0_a		16	10	4	1	0	1	1	29
Alter (2001)	GI	0.39	0.86	26	39	1	0	0	3	0	10
Aluja & Blanch (2007)	GI	0.10	0.94	742	1075	4	1	1	2	1	4
Anderson (1986)	GI	0.31		60	135	5	0	0	2	1	10
Antonowicz (2002)	GI	0.02	1.13	106	106	3	1	0	0	0	29
Archer & Webb (2006)	GI	0.14	0.99	88	219	4	1	1	0	1	29

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Archer et al (1995)	GI	0.23	1.18	160	160	0	1	1	0	1	10
Baca-Garcia et al (2006)	GI	-0.11	0.97	193	124	0	1	1	1	1	29
Baca-Garcia et al (2006)	GI	-0.05	0.95	44	37	0	1	0	1	1	29
Baca-Garcia et al (2004)	GI	-0.05	0.91	124	99	0	1	1	1	1	29
Bagge et al (2004)	GI	-0.04		156	195	2	0	0	0	1	10
Baker & Yardley (2002)	GI	0.57	1.00	193	227	2	1	0	3	1	10
Balodis et al (2007)	GI	0.14	0.76	29	37	4	0	0	0	1	29
Bare (2006)	GI	-0.08		41	51	4	1	0	0	0	29
Bazargan-Hejazi et al (2007)	GI	0.34	1.30	243	169	4	0	0	1	1	4
Bembenutty & Karabenick (1998)	GI	0[a]		148	221	3	1	0	0	1	10
Berlin et al (2005)	GI	-0.12	0.73	10	29	6	0	0	1	1	29
Bjork et al (2004)	GI	0.01	1.39	27	14	5	1	0	1	1	29
Brezo et al (2006)	GI	0.40		496	648	4	0	0	1	1	29
Brown et al (2006)	GI	0[a]		21	37	6	0	0	1	1	29
Caci et al (2003b)	GI	0.11	1.15	197	364	4	1	1	0	1	4

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Camatla et al (1995)	GI	-0.36	0.64	47	86	3	0	0	0	1	4
Case (2007)	GI	0.26	1.20	727	588	1	1	1	3	1	10
Caseras et al (2003)	GI	0.28	1.09	117	421	3	1	1	0	1	4
Caseras et al (2003)	GI	-0.16	0.99	117	421	3	1	1	0	1	10
Casillas (2006)	GI	-0.18		84	125	4	1	0	1	0	10
Casillas (2006)	GI	0.14		84	125	4	1	0	1	0	10
Chabrol et al (2004)	GI	0.25		435	181	2	1	1	3	1	10
Chen et al (2007)	GI	-0.17		29	29	4	1	0	1	1	29
Chung & Martin (2002)	GI	0_a		119	54	2	0	0	1	1	4
Clark et al (2005)	GI	0.89	0.48	27	13	4	1	1	1	1	29
Clarke (2004)	GI	0.23	1.10	29	118	4	1	1	0	1	4
Clarke (2006)	GI	0.29	1.02	33	136	4	1	1	0	1	4
Clift et al (1993)	GI	-0.04	0.89	176	333	4	1	1	1	1	4
Colder & Stice (1998)	GI	-0.41		164	207	2	1	0	0	1	10
Colom et al (2007)	GI	0.07	0.67	68	67	1	1	1	3	1	10

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Compton & Kaslow (2005)	GI	0.43	1.92	49	50	5	1	0	1	1	29
Cooper et al (2000)	GI	0.12		783	883	4	0	0	1	1	4
Cooper et al (2003)	GI	0.04		981	997	2	0	0	1	1	10
Corr et al (1995)	GI	0.66	1.02	15	14	0	1	1	0	1	4
Corulla (1987)	GI	0.06	1.22	92	215	4	1	1	0	1	4
Curry & Piquero (2003)	GI	-0.17	1.03	286	172	3	1	0	0	1	10
Cyders et al (2007)	GI	0	1.62	175	175	3	0	0	0	1	10
Cyders et al (2007)	GI	0.14	1.31	43	165	3	0	0	0	1	10
Cyders et al (2007)	GI	0.14	1.19	168	147	3	0	0	0	1	10
Dahlen et al (2004)	GI	-0.18	0.99	67	157	3	1	0	0	1	29
Davelaar et al (2008)	GI	0.26	1.17	22	64	0	2	0	0	1	10
Davelaar et al (2008)	GI	0.08	0.76	19	78	0	2	0	0	1	10
Davelaar et al (2008)	GI	0.36	0.56	20	68	0	2	0	0	1	10
Davis et al (2007)	GI	0.41	0.80	81	164	5	0	0	1	1	29
De Flores et al (1986)	GI	-0.01	1.15	94	122	3	1	1	0	1	4

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Deffenbacher et al (2003)	GI	0[a]		137	233	3	1	0	0	1	29
DePasquale et al (2001)	GI	-0.06		41	55	2	1	0	0	1	4
Dhuse (2006)	GI	0.14		104	230	3	0	0	0	0	4
Diaz & Pickering (1993)	GI	-0.04	1.50	89	82	4	0	1	1	1	4
Dinn et al (2002)	GI	0[a]		28	75	3	1	0	0	1	4
Doran, McChargue, et al (2007)	GI	0[a]		87	115	3	1	0	0	1	29
Doran, Spring, et al (2007)	GI	0.39	1.94	30	30	5	1	0	2	1	29
Durante (2002)	GI	0		271	103	5	0	0	1	0	10
Enticott et al (2006)	GI	-0.20	0.83	14	17	5	1	1	1	1	29
Eysenck & Abdel-Khalik (1992)	GI	-0.11	1.02	476	486	3	0	2	0	1	4
Eysenck & Abdel-Khalik (1992)	GI	0.05	0.89	147	179	3	0	1	0	1	4
Eysenck & Jamieson (1986)	GI	0.07	0.87	523	529	1	0	0	3	1	4
Eysenck & Jamieson (1986)	GI	0.07	0.85	533	777	1	0	1	3	1	4
Eysenck (1981)	GI	0.22	1.21	118	309	1	0	1	3	1	4
Eysenck et al (1985)	GI	-0.21	1.00	559	761	6	0	1	1	1	4

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Eysenck et al (1985)	GI	0.14	0.94	383	206	4	0	1	1	1	4
Eysenck et al (1990)	GI	-0.16	0.98	239	184	5	0	1	1	1	4
Eysenck et al (1990)	GI	-0.41	0.91	175	214	5	0	1	1	1	4
Fallgatter & Herrmann (2001)	GI	0.23	0.84	12	10	6	1	1	1	1	4
Fingeret et al (2005)	GI	0.02	1.28	42	49	4	0	0	1	1	29
Flora (2007)	GI	0.22		125	263	3	0	0	0	0	10
Flory et al (2006)	GI	0.36	0.99	154	197	6	0	0	1	1	29
Ford (1995)	GI	-0.01	0.92	220	252	3	0	0	0	0	4
Fossati et al (2001)	GI	-0.07	1.01	273	490	4	0	1	0	1	29
Fossati et al (2002)	GI	0.17	1.30	209	354	2	0	1	3	1	29
Fu et al (2007)	GI	0.04	1.04	1214	1248	3	2	2	0	1	29
Galanti et al (2007)	GI	0.54		28	65	6	0	0	1	1	29
Giancola & Parrott (2005)	GI	-0.06	0.89	164	166	4	1	0	1	1	29
Glicksohn & Nahari (2007)	GI	0.24	0.93	105	127	2	1	2	0	1	4
Glicksohn & Nahari (2007)	GI	-0.06	1.00	105	127	2	1	2	0	1	29

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Grano et al (2007)	GI	-0.19	0.71	520	3808	5	1	1	1	1	28
Green (1995)	GI	0.02		48	76	4	1	0	0	0	4
Gudjonsson et al (2006)	GI	0.02	1.00	683	861	3	0	1	2	1	4
Gupta & Gupta (1998)	GI	0.47	1.29	100	100	4	0	2	0	1	4
Hawton et al (2002)	GI	-0.09	1.08	2911	2374	2	1	1	3	1	10
Heaven (1989)	GI	-0.11	0.92	69	100	2	1	1	3	1	4
Heaven (1991)	GI	-0.37	1.09	70	100	2	1	1	3	1	4
Henle (2005)	GI	0.35		70	81	4	0	0	0	1	10
Hewlett & Smith (2006)	GI	0.17	1.09	120	164	4	1	1	1	1	4
Hulsey (2001)	GI	0_a		107	99	4	1	0	0	0	4
Hunt et al (2005)	GI	0.45	0.68	22	58	3	0	0	0	1	29
Jack & Ronan (1998)	GI	0_a		119	47	4	0	1	1	1	4
Jackson & Matthews (1988)	GI	0.34	1.28	30	58	5	1	1	0	1	4
January (2003)	GI	0.22		34	84	3	0	0	2	0	10
Justus et al (2001)	GI	0.25	0.96	87	103	4	0	0	0	1	4

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Kazemi (2007)	GI	0.42	1.73	14	24	2	0	0	0	0	29
Kazemi (2007)	GI	0.16	0.78	28	89	2	0	0	0	0	29
Keilp et al (2005)	GI	0[a]		21	37	5	1	0	1	1	29
Ketzenberger & Forrest (2000)	GI	0[a]		148	257	6	0	0	1	1	29
Kirby & Petry (2004)	GI	0.33	1.24	33	27	5	1	0	1	1	4
Klinteberg et al (1987)	GI	-0.22	0.62	29	32	2	0	1	3	1	4
Klinteberg et al (1987)	GI	-0.15	0.66	29	32	2	0	1	3	1	28
Krueger et al (2007)	GI	0.20	1.14	435.5	435.5	3	1	0	0	1	10
Krueger et al (2007)	GI	-0.03	0.92	435.5	435.5	3	1	0	0	1	10
Krueger et al (2007)	GI	-0.03	0.87	435.5	435.5	3	1	0	0	1	10
Lejuez et al (2002)	GI	0.43		43	43	3	1	0	1	1	4
Lejuez et al (2002)	GI	0.52		43	43	3	1	0	1	1	29
Lejuez et al (2003)	GI	-0.20		30	30	3	1	0	0	1	4
Lennings (1991)	GI	0[a]		22	80	4	1	1	0	1	28
Lennings & Burns (1998)	GI	0[a]		15	54	4	1	1	0	1	28

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Leshem & Glicksohn (2007)	GI	0_a		59	123	2	1	2	3	1	4
Leshem & Glicksohn (2007)	GI	0_a		59	123	2	1	2	3	1	29
Li & Chen (2007)	GI	0.06	1.00	353	367	2	1	2	3	1	29
Lijffijit et al (2005)	GI	0.10	1.14	193	855	3	0	1	0	1	4
Llorenet & Torrubia (1988)	GI	0.22	1.12	121	61	3	1	1	0	1	4
Lopez Viets (2001)	GI	0.64	0.97	54	61	3	0	0	0	0	4
Luengo et al (1990)	GI	-0.01	1.13	55	252	4	1	1	0	1	4
Luengo et al (1990)	GI	-0.04	0.89	55	252	4	1	1	0	1	29
Lyke & Spinella (2004)	GI	0.39	1.25	32	80	4	0	0	1	1	29
Macpherson et al (1996)	GI	-0.04	0.77	22	19	0	0	0	0	1	4
Macpherson et al (1996)	GI	-0.17	0.68	22	22	0	0	0	0	1	4
Magid et al (2007)	GI	0.15	0.85	111	199	3	0	0	0	1	28
Malle & Neubauer (1991)	GI	-0.61		25	40	4	1	1	0	1	10
Mallet & Vignoli (2007)	GI	-0.23	0.85	235	401	2	1	1	3	1	4
Manuck et al (1998)	GI	-0.17	0.65	59	60	6	1	0	1	1	29

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
McCrae & Costa (1985)	GI	-0.21	1.10	423	129	6	1	0	1	1	4
McFatter (1998)	GI	0.18	0.97	578	932	2	1	0	0	1	4
Mcleish & Oxoby (2007)	GI	-0.20	0.86	50	32	3	0	0	0	1	29
McMahon & Washburn (2003)	GI	0[a]		56	100	1	0	0	3	1	10
Meadows (1995)	GI	0.24	0.70	262	336	0	1	0	0	0	10
Mehrabian (2000)	GI	0.28		107	195	3	1	0	2	1	10
Mejia et al (2006)	GI	0.33	1.10	473	644	1	1	0	3	1	10
Molto et al (1993)	GI	-0.02	0.66	347	448	3	1	1	0	1	4
Nagoshi (1999)	GI	0.04	0.93	52	71	3	1	0	0	1	4
Nagoshi et al (1994)	GI	0[a]		99	91	3	1	0	0	1	4
Neal & Carey (2007)	GI	0.23	1.11	75	131	3	1	0	0	1	4
Neal & Carey (2007)	GI	0.12	0.99	75	131	3	1	0	0	1	10
Neubauer (1992)	GI	0[a]		32	81	5	1	1	0	1	4
Nietfeld & Bosme (2003)	GI	-0.41		30	29	4	1	0	0	1	4
Nower et al (2004)	GI	-0.10	1.20	101	150	3	0	0	0	0	4

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Nower et al (2004)	GI	0.01	1.03	462	523	3	0	0	0	0	4
Oas (1984)	GI	0.27		66	48	2	1	0	1	1	10
Overman et al (2004)	GI	0_a		240	240	3	1	0	2	1	10
Owsley (2003)	GI	-0.05	1.08	135	129	6	0	0	1	1	4
Paaver et al (2007)	GI	0.03	0.88	222	261	2	0	1	1	1	29
Patock-Peckham & Morgan-lopez (2006)	GI	0.13	0.94	215	206	2	0	0	0	1	4
Patock-Peckham et al (1998)	GI	0_a		142	222	3	0	0	0	1	4
Patton et al (1995)	GI	0.16	1.01	130	279	2	1	0	0	1	29
Pearson et al (1986)	GI	-0.10		279	290	1	1	1	3	1	4
Peluso et al (2007)	GI	-0.21	0.53	17	34	5	1	0	1	1	29
Penas-Lledo et al (2004)	GI	0.61	1.30	49	72	1	0	1	0	1	10
Plouffe & Gravelle (1989)	GI	0_a		40	40	6	0	0	1	1	10
Pompili et al (2007)	GI	0.25	0.87	141	159	4	1	1	0	1	10
Pompili et al (2007)	GI	-0.03	0.76	141	159	4	1	1	0	1	10

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Pompili et al (2007)	GI	0.18	0.82	141	159	4	1	1	0	1	29
Pontzer (2007)	GI	0.01		258	269	0	1	0	0	0	10
Ramadan & McMurran (2005)	GI	0.29	1.13	39	69	3	0	1	0	1	29
Rawlings (1984)	GI	0.06		18	17	0	1	1	0	1	4
Reynolds, Ortengren, et al (2006)	GI	0[a]		35	35	4	1	0	1	1	4
Reynolds, Ortengren, et al (2006)	GI	0[a]		35	35	4	1	0	1	1	29
Reynolds, Richards, et al (2006)	GI	0.37	1.35	11	13	4	1	0	1	1	29
Reynolds et al (2007)	GI	0[a]		25	26	1	1	0	1	1	29
Rhyff et al (1983)	GI	0[a]		135	135	3	0	0	0	1	10
Rigby et al (1989)	GI	0.33	1.00	56	59	1	1	1	3	1	4
Rigby et al (1992)	GI	0[a]		48	57	1	1	1	3	1	4
Rim (1994)	GI	-0.16	1.38	53	45	4	3	2	0	1	4
Robinson (1990)	GI	-0.26		69	125	3	1	0	0	1	4
Romero et al (2001)	GI	0.08		435	529	2	0	1	3	1	4
Rowe et al (1995)	GI	0.41		407	425	1	1	0	1	1	10

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Sahoo (1985)	GI	0.49		80	80	2	1	2	3	1	4
Saklofske & Eysenck (1983)	GI	-0.69		20	11	1	1	0	3	1	4
Saklofske & Eysenck (1983)	GI	0.09	1.08	84	76	1	1	0	3	1	4
Saklofske & Eysenck (1983)	GI	0.01	0.96	69	68	1	1	0	3	1	4
Saklofske & Eysenck (1983)	GI	0.22	0.79	61	70	1	1	0	3	1	4
Saklofske & Eysenck (1983)	GI	0.21	0.73	74	61	1	1	0	3	1	4
Sasaki & Kanachi (2005)	GI	0.32	0.90	54	40	4	1	2	0	1	10
Schaughency et al (1994)	GI	0.16	1.41	425	413	1	0	1	1	1	10
Schwartz (2007)	GI	0.27	1.21	55	168	3	1	0	0	1	10
Schweizer (2002)	GI	0_{a}		26	82	4	1	1	2	1	10
Schweizer (2002)	GI	0_{a}		26	82	4	1	1	2	1	10
Schweizer (2002)	GI	0_{a}		26	82	4	1	1	2	1	10
Schweizer (2002)	GI	0_{a}		26	82	4	1	1	2	1	10
Sigurdsson et al (2006)	GI	-0.02	0.91	191	242	3	1	1	0	1	4
Simons & Carey (2006)	GI	0.04	1.11	272	549	3	1	0	0	1	4

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Simons (2003)	GI	0.15	1.22	97	206	3	1	0	0	1	4
Simons et al (2005)	GI	0.19	1.05	253	578	3	1	0	0	1	10
Smith et al (2006)	GI	0.02	2.64	87	98	4	1	1	0	1	29
Smith et al (2006)	GI	-0.07	0.72	44	62	4	1	1	1	1	29
Soloff et al (2003)	GI	0.24	0.90	36	21	4	1	0	1	1	29
Spence et al (1991)	GI	-0.15	0.68	183	292	3	0	0	0	1	4
Stanford et al (1995)	GI	0.12	0.88	60	154	4	1	0	0	1	29
Stanford et al (1996)	GI	0.17	1.05	278	287	2	1	0	3	1	29
Stanford et al (1996)	GI	0.34	1.04	226	356	4	1	0	0	1	29
Starrett (1983)	GI	0.67	1.18	17	28	2	1	0	3	1	4
Starrett (1983)	GI	0.17	1.03	19	46	3	1	0	0	1	4
Starrett (1983)	GI	-0.05	0.58	26	27	1	1	0	3	1	4
Stoltenberg et al (2006)	GI	-0.38	0.81	111	87	3	1	0	0	1	10
Stoltenberg et al (2006)	GI	0.61	0.78	111	87	3	1	0	0	1	10
Stoltenberg et al (2006)	GI	0.01	0.70	111	87	3	1	0	0	1	10

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Stoltenberg et al (2008)	GI	0.59	0.87	72	120	4	1	0	0	1	29
Thompson et al (2007)	GI	0	1.10	7416	7611	1	0	0	3	1	10
Torrubia et al (2001)	GI	0.03	0.96	240	491	3	1	1	0	1	4
Torrubia et al (2001)	GI	0.12	0.87	43	119	3	1	1	0	1	4
Torrubia et al (2001)	GI	-0.05	0.86	117	223	3	1	1	0	1	4
Toyer (1999)	GI	0.45	1.44	805	815	2	1	0	3	0	10
Van den Broek et al (1992)	GI	0_a		18	18	4	2	1	1	1	4
Van den Broek et al (1992)	GI	0_a		18	18	4	2	1	1	1	29
Vazsonyi et al (2006)	GI	-0.02	1.03	10041	10193	2	1	0	3	1	10
Vigil-Colet & Cordorniu-Raga (2004)	GI	0.48	1.76	16	68	4	1	1	0	1	4
Vigil-Colet (2007)	GI	-0.18	1.10	18	77	4	1	1	0	1	4
Von Knorring et al (1987)	GI	-0.04	0.88	56	81	5	1	1	1	1	28
Weller (2001)	GI	0.76		30	30	0	0	0	2	0	4
Weyers et al (1995)	GI	-0.45	1.39	40	40	4	1	1	0	1	4
Weyers et al (1995)	GI	-0.73	0.86	40	40	6	1	1	0	1	4

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Wingo (2002)	GI	0.19	1.60	30	25	2	0	0	1	0	10
Zawacki (2002)	GI	-0.04		90	90	4	0	0	0	0	4
Zimmerman et al (2004)	GI	-0.12	0.81	50	170	4	1	1	0	1	4
Zimmerman et al (2005)	GI	-0.13	0.59	26	110	4	1	1	0	1	4
Zuckerman et al (1988)	GI	-0.12	1.42	73	198	0	1	0	0	1	10
Zuckerman et al (1988)	GI	-0.13	1.00	73	198	0	1	0	0	1	10
Zuckerman et al (1988)	GI	0	0.86	73	198	0	1	0	0	1	28
Avila & Parcet (2000)	PS	0[a]		23	85	3	1	1	0	1	13
Bjork et al (2004)	PS	-0.51	1.13	27	14	5	1	0	1	1	19
Caci et al (2007)	PS	-0.25	0.67	36	100	2	1	1	0	1	13
Caci et al (2007)	PS	-0.74	0.87	35	109	2	1	1	0	1	19
Caseras et al (2003)	PS	-0.11	0.97	117	421	3	1	1	0	1	13
Caseras et al (2003)	PS	-0.16	0.93	117	421	3	1	1	0	1	13
Caseras et al (2003)	PS	-0.56	1.44	117	421	3	1	1	0	1	19
Caseras et al (2003)	PS	-0.44	1.05	117	421	3	1	1	0	1	36

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Davis et al (2007)	PS	0.13	1.04	81	164	5	0	0	1	1	13
Li et al (2007)	PS	0.02	1.09	235	313	3	2	2	0	1	13
Nijs et al (2007)	PS	-0.18	1.13	20	24	4	0	1	1	1	19
Pang & Schultheiss (2005)	PS	-0.45	1.56	154	172	3	0	0	0	1	19
Segarra et al (2007)	PS	-0.45	0.89	79	114	3	0	1	0	1	13
Segarra et al (2007)	PS	-0.84	0.98	79	114	3	0	1	0	1	19
Smillie et al (2006)	PS	-0.68	0.93	427	116	4	1	1	2	1	19
Stewart et al (2004)	PS	-0.37	1.15	347	550	3	0	1	0	1	36
Torrubia et al (2001)	PS	-0.24	1.12	96	276	3	1	1	0	1	13
Torrubia et al (2001)	PS	0.05	1.12	240	491	3	1	1	0	1	13
Torrubia et al (2001)	PS	-0.21	0.98	229	599	3	1	1	0	1	13
Uzieblo et al (2007)	PS	-0.73	1.27	167	227	3	0	1	0	1	19
van den bree et al (2006)	PS	-0.55	0.92	240	340	2	0	0	1	1	36
Weyers et al (1995)	PS	-0.38	1.19	40	40	4	1	1	0	1	36
Weyers et al (1995)	PS	-0.14	1.10	40	40	6	1	1	0	1	36

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Avila & Parcet (2000)	RS	0[a]		23	85	3	1	1	0	1	14
Bjork et al (2004)	RS	-0.25	1.23	27	14	5	1	0	1	1	16
Bjork et al (2004)	RS	0.18	1.00	27	14	5	1	0	1	1	17
Bjork et al (2004)	RS	-0.59	0.45	27	14	5	1	0	1	1	18
Caci et al (2007)	RS	0.08	0.52	36	100	2	1	1	0	1	14
Caci et al (2007)	RS	0.09	0.92	35	109	2	1	1	0	1	16
Caci et al (2007)	RS	-0.14	1.40	35	109	2	1	1	0	1	17
Caci et al (2007)	RS	-0.42	1.26	35	109	2	1	1	0	1	18
Caseras et al (2003)	RS	0.60	1.45	117	421	3	1	1	0	1	14
Caseras et al (2003)	RS	0.53	0.86	117	421	3	1	1	0	1	14
Caseras et al (2003)	RS	0.14	0.98	117	421	3	1	1	0	1	16
Caseras et al (2003)	RS	0.13	1.06	117	421	3	1	1	0	1	17
Caseras et al (2003)	RS	-0.11	1.18	117	421	3	1	1	0	1	18
Caseras et al (2003)	RS	-0.48	0.95	117	421	3	1	1	0	1	32
Cyders et al (2007)	RS	0.03	1.19	175	175	3	0	0	0	1	16

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Cyders et al (2007)	RS	0.05	1.18	175	175	3	0	0	0	1	17
Cyders et al (2007)	RS	-0.12	0.87	175	175	3	0	0	0	1	18
Davis et al (2007)	RS	0.46	1.16	81	164	5	0	0	1	1	14
Li et al (2007)	RS	0.31	1.11	235	313	3	2	2	0	1	14
Nijs et al (2007)	RS	-0.68	0.57	20	24	4	0	1	1	1	16
Nijs et al (2007)	RS	-0.37	0.85	20	24	4	0	1	1	1	17
Nijs et al (2007)	RS	-0.49	1.13	20	24	4	0	1	1	1	18
Nijs et al (2007)	RS	-0.70	0.72	20	24	4	0	1	1	1	31
Pang & Schultheiss (2005)	RS	0.15	1.38	154	172	3	0	0	0	1	16
Pang & Schultheiss (2005)	RS	0.15	0.98	154	172	3	0	0	0	1	17
Pang & Schultheiss (2005)	RS	0.01	1.06	154	172	3	0	0	0	1	18
Pang & Schultheiss (2005)	RS	0.15	1.12	154	172	3	0	0	0	1	31
Segarra et al (2007)	RS	0.49	1.14	79	114	3	0	1	0	1	14
Segarra et al (2007)	RS	0.01	1.47	79	114	3	0	1	0	1	16
Segarra et al (2007)	RS	-0.11	1.08	79	114	3	0	1	0	1	17

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Segarra et al (2007)	RS	-0.34	0.97	79	114	3	0	1	0	1	18
Segarra et al (2007)	RS	-0.20	0.98	79	114	3	0	1	0	1	31
Smillie et al (2006)	RS	0.14	1.18	427	116	4	1	1	2	1	16
Smillie et al (2006)	RS	0.25	0.80	427	116	4	1	1	2	1	17
Smillie et al (2006)	RS	-0.54	1.11	427	116	4	1	1	2	1	18
Torrubia et al (2001)	RS	0.53	1.45	229	599	3	1	1	0	1	14
Torrubia et al (2001)	RS	0.45	1.12	51	156	3	1	1	0	1	14
Torrubia et al (2001)	RS	0.45	1.03	240	491	3	1	1	0	1	14
Uzieblo et al (2007)	RS	-0.02	1.07	167	227	3	0	1	0	1	16
Uzieblo et al (2007)	RS	0.04	1.52	167	227	3	0	1	0	1	17
Uzieblo et al (2007)	RS	-0.31	0.81	167	227	3	0	1	0	1	18
Uzieblo et al (2007)	RS	-0.13	1.13	167	227	3	0	1	0	1	31
van den bree et al (2006)	RS	-0.61	1.40	240	340	2	0	0	1	1	32
Weyers et al (1995)	RS	-0.75	1.10	40	40	4	1	1	0	1	32
Weyers et al (1995)	RS	-0.38	0.94	40	40	6	1	1	0	1	32

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Aklin et al (2005)	SS/RT	0.14		26	25	1	1	0	1	1	12
Alexander et al (2004)	SS/RT	0.29	1.00	82	87	2	0	1	0	1	11
Alter (2001)	SS/RT	-0.74	0.67	26	39	1	0	0	3	0	33
Aluja & Blanch (2007)	SS/RT	0.52	1.14	742	1075	4	1	1	2	1	5
Anestis et al (2007)	SS/RT	0	0.83	12	58	3	1	0	0	1	9
Bates & Labouvie (1995)	SS/RT	0.56		654	654	2	0	0	2	1	21
Bazargan-Hejazi et al (2007)	SS/RT	-0.45	1.03	243	169	4	0	0	1	1	11
Bazargan-Hejazi et al (2007)	SS/RT	0.38	1.09	243	169	4	0	0	1	1	30
Billieux et al (2008)	SS/RT	0.46	0.88	74	76	4	1	1	2	1	9
Bjork et al (2004)	SS/RT	0.60	1.43	27	14	5	1	0	1	1	20
Bjork et al (2004)	SS/RT	0.48	1.73	27	14	5	1	0	1	1	21
Bjork et al (2004)	SS/RT	0.14	1.39	27	14	5	1	0	1	1	22
Bjork et al (2004)	SS/RT	0.34	1.12	27	14	5	1	0	1	1	23
Bjork et al (2004)	SS/RT	0.49	1.57	27	14	5	1	0	1	1	30
Caci et al (2003b)	SS/RT	0.57	1.20	197	364	4	1	1	0	1	5

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Caci et al (2003a)	SS/RT	0.19	0.88	201	390	4	1	1	0	1	24
Camatla et al (1995)	SS/RT	0.64	0.67	47	86	3	0	0	0	1	5
Caseras et al (2003)	SS/RT	0.04	1.00	117	421	3	1	1	0	1	12
Casillas (2006)	SS/RT	0.61		84	125	4	1	0	1	0	9
Casillas (2006)	SS/RT	0.32		84	125	4	1	0	1	0	20
Casillas (2006)	SS/RT	0.72		84	125	4	1	0	1	0	21
Casillas (2006)	SS/RT	0.49		84	125	4	1	0	1	0	23
Cherpitel (1993)	SS/RT	-0.54		575	575	0	0	0	4	1	11
Cherpitel (1993)	SS/RT	0.30		575	575	0	0	0	4	1	11
Cherpitel (1993)	SS/RT	0.30		575	575	0	0	0	4	1	12
Claes et al (2000)	SS/RT	0.43		159	156	6	1	1	1	1	24
Clarke (2004)	SS/RT	-0.31	1.18	29	118	4	1	1	0	1	5
Clift et al (1993)	SS/RT	0.51	0.81	176	333	4	1	1	1	1	5
Colom et al (2007)	SS/RT	0.92	1.75	68	67	1	1	1	3	1	12
Cooper et al (2003)	SS/RT	0.45		981	997	2	0	0	1	1	23

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Copping (2007)	SS/RT	1.16		94	104	1	1	1	3	0	9
Corulla (1987)	SS/RT	0.54	0.90	92	215	4	1	1	0	1	5
Cross (2007)	SS/RT	0.49	1.04	127	201	4	0	1	2	0	30
Cross (2007)	SS/RT	0.22	1.30	127	201	4	0	1	2	0	11
Cross (2008)	SS/RT	0.25	1.17	50	65	5	0	1	1	0	11
Cross (2009)	SS/RT	0.34	1.03	2261	1514	5	0	1	1	0	11
Curran (2006)	SS/RT	-0.43	0.38	61	19	5	1	0	1	0	20
Curran (2006)	SS/RT	-0.27	0.47	61	19	5	1	0	1	0	21
Curran (2006)	SS/RT	-0.60	0.53	61	19	5	1	0	1	0	22
Curran (2006)	SS/RT	-0.35	0.69	61	19	5	1	0	1	0	23
Curran (2006)	SS/RT	-0.54	0.44	61	19	5	1	0	1	0	34
Curry (2005)	SS/RT	0.54		117	173	2	0	0	1	0	9
Cyders et al (2007)	SS/RT	-0.02	1.07	175	175	3	0	0	0	1	9
Cyders et al (2007)	SS/RT	0.52	0.72	43	165	3	0	0	0	1	9
Cyders et al (2007)	SS/RT	0.51	0.64	168	147	3	0	0	0	1	9

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
d'Acrement & Van Der Linden (2005)	SS/RT	0.70	0.80	314	314	2	1	1	3	1	9
Dahlen et al (2005)	SS/RT	0.54	0.97	67	157	3	1	0	0	1	12
Dahlen et al (2005)	SS/RT	0.14	0.96	67	157	3	1	0	0	1	12
DePasquale et al (2001)	SS/RT	0.70		41	55	2	1	0	0	1	5
Dhuse (2006)	SS/RT	0.70		104	230	3	0	0	0	0	5
Diaz & Pickering (1993)	SS/RT	0.22	0.94	89	82	4	0	1	1	1	5
Driscoll et al (2006)	SS/RT	-0.77	1.24	221	386	2	0	1	3	1	33
Eysenck & Abdel-Khalik (1992)	SS/RT	0.54	0.97	476	486	3	0	2	0	1	5
Eysenck & Abdel-Khalik (1992)	SS/RT	0.55	0.66	147	179	3	0	1	0	1	5
Eysenck & Jamieson (1986)	SS/RT	0.55	0.81	533	777	1	0	1	3	1	5
Eysenck & Jamieson (1986)	SS/RT	0.37	0.70	523	529	1	0	0	3	1	5
Eysenck (1981)	SS/RT	0.19	0.92	118	309	1	0	1	3	1	5
Eysenck et al (1985)	SS/RT	0.27	1.13	559	761	6	0	1	1	1	5
Eysenck et al (1985)	SS/RT	0.65	0.75	383	206	4	0	1	1	1	5
Eysenck et al (1990)	SS/RT	0.75	1.03	175	214	5	0	1	1	1	5

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Eysenck et al (1990)	SS/RT	0.92	0.97	239	184	5	0	1	1	1	5
Fallgatter & Herrmann (2001)	SS/RT	0.28	0.72	12	10	6	1	1	1	1	5
Fischer & Smith (2004)	SS/RT	0.44		113	247	0	0	0	0	1	11
Fischer & Smith (2004)	SS/RT	0.45		113	247	0	0	0	0	1	11
Flannery et al (1994)	SS/RT	0.29	1.27	370	369	1	1	0	3	1	12
Flannery et al (1994)	SS/RT	-0.20	1.08	144	131	1	1	0	3	1	12
Flora (2007)	SS/RT	-0.12		125	263	3	0	0	0	0	12
Flora (2007)	SS/RT	-0.08		125	263	3	0	0	0	0	20
Flory et al (2006)	SS/RT	0.13	0.77	154	197	6	0	0	1	1	12
Flory et al (2006)	SS/RT	0.40	0.99	154	197	6	0	0	1	1	20
Flory et al (2006)	SS/RT	0.76	1.53	154	197	6	0	0	1	1	21
Flory et al (2006)	SS/RT	0.19	1.02	154	197	6	0	0	1	1	22
Flory et al (2006)	SS/RT	0.44	0.77	154	197	6	0	0	1	1	23
Flory et al (2006)	SS/RT	0.54	1.06	154	197	6	0	0	1	1	30
Ford (1995)	SS/RT	0	0.87	220	252	3	0	0	0	0	20

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Ford (1995)	SS/RT	0.44	0.73	220	252	3	0	0	0	0	30
Franken et al (2005)	SS/RT	0	1.47	14	21	4	1	1	2	1	24
Garland (1999)	SS/RT	-0.05		26	35	5	1	0	1	0	30
Garland (1999)	SS/RT	-0.03	1.16	26	35	5	1	0	1	0	34
Giancola & Parrott (2005)	SS/RT	0.70	0.69	164	166	4	1	0	1	1	30
Glicksohn & Nahari (2007)	SS/RT	0.68	0.92	105	127	2	1	2	0	1	5
Green (1995)	SS/RT	0.04		48	76	4	1	0	0	0	5
Gudjonsson et al (2006)	SS/RT	0.48	0.80	699	875	3	0	1	2	1	5
Hartman & Rawson (1992)	SS/RT	0.31	1.89	26	77	3	1	0	0	1	21
Hartman & Rawson (1992)	SS/RT	0.79	1.73	29	27	3	1	0	0	1	21
Hartman & Rawson (1992)	SS/RT	0.66	1.62	26	77	3	1	0	0	1	21
Hartman & Rawson (1992)	SS/RT	0.80	0.85	29	27	3	1	0	0	1	21
Hartman & Rawson (1992)	SS/RT	0.83	1.69	26	77	3	1	0	0	1	23
Hartman & Rawson (1992)	SS/RT	0.34	1.16	29	27	3	1	0	0	1	23
Hartman & Rawson (1992)	SS/RT	0.60	0.82	26	77	3	1	0	0	1	23

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Hartman & Rawson (1992)	SS/RT	0.05	0.59	29	27	3	1	0	0	1	23
Heaven (1991)	SS/RT	0.23	1.09	70	100	2	1	1	3	1	11
Heaven (1991)	SS/RT	0.13	0.69	70	100	2	1	1	3	1	12
Heaven (1991)	SS/RT	0.51	1.05	70	100	2	1	1	3	1	5
Hutchinson et al (1998)	SS/RT	-0.09	0.79	87	116	3	1	0	0	1	5
Jack & Ronan (1998)	SS/RT	0.56	0.94	119	47	4	0	1	1	1	30
Justus et al (2001)	SS/RT	0.75	0.88	87	103	4	0	0	0	1	5
Justus et al (2001)	SS/RT	0.37	1.23	87	103	4	0	0	0	1	20
Justus et al (2001)	SS/RT	0.41	0.79	87	103	4	0	0	0	1	21
Justus et al (2001)	SS/RT	0.41	0.90	87	103	4	0	0	0	1	23
Justus et al (2001)	SS/RT	-0.82	0.90	87	103	4	0	0	0	1	33
Kirby & Petry (2004)	SS/RT	0.85	0.97	33	27	5	1	0	1	1	5
Klinteberg et al (1987)	SS/RT	0.06	0.85	29	32	2	0	1	3	1	37
Krueger et al (2007)	SS/RT	0.56	1.26	435.5	435.5	0	1	0	0	1	12
Krueger et al (2007)	SS/RT	0.19	1.03	435.5	435.5	0	1	0	0	1	12

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Lejuez et al (2002)	SS/RT	0.70		43	43	3	1	0	1	1	5
Lejuez et al (2002)	SS/RT	0.90		43	43	3	1	0	1	1	30
Lejuez et al (2003)	SS/RT	0.26		30	30	3	1	0	0	1	30
Lennings (1991)	SS/RT	0_a		22	80	4	1	1	0	1	12
Lennings (1991)	SS/RT	0_a		22	80	4	1	1	0	1	30
Leshem & Glicksohn (2007)	SS/RT	0_a		59	123	2	1	2	3	1	5
Lijffijit et al (2005)	SS/RT	0.62	0.98	193	855	3	0	1	0	1	5
Lonczak et al (2007)	SS/RT	0.54	1.56	780	432	5	0	0	1	1	12
Luengo et al (1990)	SS/RT	0.57	0.85	55	252	4	1	1	0	1	5
Lundahl (1995)	SS/RT	1.12	0.66	21	23	3	0	0	0	0	5
Lundahl (1995)	SS/RT	0.66	1.94	21	23	3	0	0	0	0	20
Lundahl (1995)	SS/RT	0_a		21	23	3	0	0	0	0	21
Lundahl (1995)	SS/RT	0_a		21	23	3	0	0	0	0	22
Lundahl (1995)	SS/RT	1.20	0.35	21	23	3	0	0	0	0	23
Magid & Colder (2007)	SS/RT	0.51	0.91	131	136	3	0	0	0	1	9

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Magid et al (2007)	SS/RT	0.18	0.73	111	199	3	0	0	0	1	37
Mallet & Vignoli (2007)	SS/RT	-0.30	1.07	235	401	2	1	1	3	1	12
Mallet & Vignoli (2007)	SS/RT	0.79	1.00	235	401	2	1	1	3	1	12
Matczak (1990)	SS/RT	0.39		152.5	152.5	2	0	1	3	1	30
McAlister et al (2005)	SS/RT	-0.39		43	76	3	0	1	0	1	24
McDaniel & Zuckerman (2003)	SS/RT	0.32	1.18	347	436	6	1	0	1	1	34
Meadows (1995)	SS/RT	0.54	0.98	262	336	0	1	0	0	0	30
Nagoshi (1999)	SS/RT	0.65	0.91	52	71	3	1	0	0	1	5
Ng et al (1998)	SS/RT	0.45	0.76	101	101	1	2	2	3	1	12
Overman et al (2004)	SS/RT	0[a]		240	240	3	1	0	2	1	12
Owsley (2003)	SS/RT	0.52	1.46	135	129	6	0	0	1	1	5
Pearson et al (1986)	SS/RT	0.54		279	290	1	1	1	3	1	5
Pearson et al (1986)	SS/RT	0.49		279	290	1	1	1	3	1	12
Perez & Torrubia (1985)	SS/RT	0.61	1.47	173	176	3	1	1	0	1	30
Perez & Torrubia (1985)	SS/RT	0.30	1.31	173	176	3	1	1	0	1	20

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Perez & Torrubia (1985)	SS/RT	0.94	1.62	173	176	3	1	1	0	1	21
Perez & Torrubia (1985)	SS/RT	-0.20	1.14	173	176	3	1	1	0	1	22
Perez & Torrubia (1985)	SS/RT	0.26	1.14	173	176	3	1	1	0	1	23
Pfefferbaum et al (1994)	SS/RT	0.54		148	148	3	0	0	0	1	23
Plastow (2007)	SS/RT	0.73	1.01	56	267	3	0	0	0	0	9
Ramadan & McMurran (2005)	SS/RT	0.80	0.50	39	69	3	0	1	0	1	30
Rammsayer et al (2000)	SS/RT	-0.14	0.75	25	35	4	1	1	0	1	24
Rawlings (1984)	SS/RT	-0.08		18	17	0	1	1	0	1	5
Reeve (2007)	SS/RT	0.68	1.35	72	125	3	1	0	0	1	24
Reynolds, Ortengren, et al (2006)	SS/RT	0[a]		35	35	4	1	0	1	1	5
Rim (1994)	SS/RT	-0.24	0.65	53	45	4	2	2	0	1	5
Romero et al (2001)	SS/RT	0.31		435	529	2	0	1	3	1	20
Romero et al (2001)	SS/RT	0.35		435	529	2	0	1	3	1	21
Romero et al (2001)	SS/RT	0.03		435	529	2	0	1	3	1	22
Romero et al (2001)	SS/RT	0.16		435	529	2	0	1	3	1	23

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Roth et al (2007)	SS/RT	0.21	1.09	1095	1244	6	1	1	1	1	12
Roth et al (2007)	SS/RT	0.16	1.00	1095	1244	6	1	1	1	1	12
Roth et al (2007)	SS/RT	0.17	0.93	1095	1244	6	1	1	1	1	12
Sahoo (1985)	SS/RT	0[a]		80	80	0	1	2	3	1	11
Saklofske & Eysenck (1983)	SS/RT	0.11	2.05	20	11	1	1	0	3	1	5
Saklofske & Eysenck (1983)	SS/RT	0.29	0.80	84	76	1	1	0	3	1	5
Saklofske & Eysenck (1983)	SS/RT	0.80	0.78	74	61	1	1	0	3	1	5
Saklofske & Eysenck (1983)	SS/RT	0.66	0.72	69	68	1	1	0	3	1	5
Saklofske & Eysenck (1983)	SS/RT	0.56	0.65	61	70	1	1	0	3	1	5
Sasaki & Kanachi (2005)	SS/RT	0.42	1.17	54	40	4	1	2	0	1	30
Sigurdsson et al (2006)	SS/RT	0.50	0.79	191	242	3	1	1	0	1	5
Simo et al (1991)	SS/RT	-0.05	1.10	136	144	3	1	1	2	1	20
Simo et al (1991)	SS/RT	0.49	1.84	136	144	3	1	1	2	1	21
Simo et al (1991)	SS/RT	0.29	1.28	136	144	3	1	1	2	1	22
Simo et al (1991)	SS/RT	0.94	1.09	136	144	3	1	1	2	1	23

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Simo et al (1991)	SS/RT	0.71	1.00	136	144	3	1	1	2	1	30
Spillane & Smith (2006a)	SS/RT	0.35	2.54	97	117	2	0	0	0	1	9
Spillane & Smith (2006b)	SS/RT	0.25	0.98	148	210	3	0	0	0	1	9
Spinella (2005)	SS/RT	0.76	1.05	50	51	4	1	0	1	1	12
Stewart et al (2004)	SS/RT	0.09	1.11	347	550	3	0	1	0	1	12
Torrubia et al (2001)	SS/RT	0.31	1.11	229	599	3	1	1	0	1	20
Torrubia et al (2001)	SS/RT	0.72	1.26	229	599	3	1	1	0	1	21
Torrubia et al (2001)	SS/RT	0.01	1.26	229	599	3	1	1	0	1	22
Torrubia et al (2001)	SS/RT	0.13	0.97	229	599	3	1	1	0	1	23
Torrubia et al (2001)	SS/RT	0.45	1.09	229	599	3	1	1	0	1	30
van den bree et al (2006)	SS/RT	0.10	1.00	240	340	2	0	0	1	1	12
Van der Linden et al (2006)	SS/RT	0.41	0.87	39	195	4	1	1	0	1	9
Verdejo-Garcia et al (2007)	SS/RT	0[a]		14	22	5	1	1	1	1	9
Vigil - Colet & Cordorniu-Raga (2004)	SS/RT	0.47	0.85	16	68	4	1	1	0	1	5
Vigil - Colet & Cordorniu-Raga (2004)	SS/RT	0.47	1.33	16	68	4	1	1	0	1	24

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Vigil-Colet & Morales-Vives (2005)	SS/RT	0.26	0.91	107	134	1	1	1	3	1	24
Vigil-Colet (2007)	SS/RT	0.23	1.33	18	77	4	1	1	0	1	5
Vigil-Colet (2007)	SS/RT	0.55	0.95	18	77	4	1	1	0	1	24
Vigil-Colet et al (in press)	SS/RT	0.14	1.02	208	114	5	1	1	1	1	24
Vigil-Colet et al (in press)	SS/RT	0.23	0.92	72	150	4	1	1	0	1	24
Von Knorrin et al (1987)	SS/RT	0.10	0.92	56	81	5	1	1	1	1	37
Weyers et al (1995)	SS/RT	0.54	1.64	40	40	6	1	1	0	1	5
Weyers et al (1995)	SS/RT	0.88	0.92	40	40	4	1	1	0	1	5
Weyers et al (1995)	SS/RT	-0.53	2.15	40	40	4	1	1	0	1	12
Weyers et al (1995)	SS/RT	-0.32	1.15	40	40	6	1	1	0	1	12
Weyers et al (1995)	SS/RT	0.11	1.02	40	40	4	1	1	0	1	30
Weyers et al (1995)	SS/RT	0.26	0.76	40	40	6	1	1	0	1	30
Wilson & Daly (2006)	SS/RT	0.54	0.85	165	119	2	0	0	3	1	30
Yang (2002)	SS/RT	1.10		189	216	4	1	0	0	0	34
Yang (2002)	SS/RT	0.36	0.91	189	216	4	1	0	0	0	34

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Zaleskiewicz (2001)	SS/RT	0.49		65	94	4	1	1	0	1	11
Zaleskiewicz (2001)	SS/RT	0.51		65	94	4	1	1	0	1	11
Zimmerman et al (2004)	SS/RT	0.64	0.85	50	170	4	1	1	0	1	5
Zimmerman et al (2005)	SS/RT	0.84	0.88	26	110	4	1	1	0	1	5
Zuckerman et al (1978)	SS/RT	0.10	1.11	97	122	3	1	0	1	1	20
Zuckerman et al (1978)	SS/RT	0.45	0.93	97	122	3	1	0	1	1	21
Zuckerman et al (1978)	SS/RT	-0.10	0.91	97	122	3	1	0	1	1	22
Zuckerman et al (1978)	SS/RT	0.36	0.78	97	122	3	1	0	1	1	23
Zuckerman et al (1978)	SS/RT	0.32	0.75	97	122	3	1	0	1	1	30
Zuckerman et al (1988)	SS/RT	0.65	1.09	73	198	0	1	0	0	1	11
Zuckerman et al (1988)	SS/RT	0.25	0.95	73	198	0	1	0	0	1	12
Zuckerman et al (1988)	SS/RT	0.25	1.10	73	198	0	1	0	0	1	20
Zuckerman et al (1988)	SS/RT	0.29	1.28	73	198	0	1	0	0	1	21
Zuckerman et al (1988)	SS/RT	-0.04	1.09	73	198	0	1	0	0	1	22
Zuckerman et al (1988)	SS/RT	0.54	0.66	73	198	0	1	0	0	1	23

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Zuckerman et al (1988)	SS/RT	0.15	0.93	73	198	0	1	0	0	1	37
Anestis et al (2007)	SF	-0.40	1.26	12	58	3	1	0	0	1	6
Anestis et al (2007)	SF	-0.68	1.95	12	58	3	1	0	0	1	7
Anestis et al (2007)	SF	-0.27	0.88	12	58	3	1	0	0	1	8
Baca-Garcia et al (2006)	SF	-0.10	0.86	44	37	0	1	0	1	1	0
Baca-Garcia et al (2006)	SF	-0.32	0.77	193	124	0	1	1	1	1	0
Baca-Garcia et al (2006)	SF	0.01	0.99	44	37	0	1	0	1	1	1
Baca-Garcia et al (2006)	SF	0.02	0.94	193	124	0	1	1	1	1	1
Baca-Garcia et al (2006)	SF	0.01	1.43	193	124	0	1	1	1	1	2
Baca-Garcia et al (2006)	SF	-0.03	0.97	44	37	0	1	0	1	1	2
Baca-Garcia et al (2004)	SF	0	0.87	124	99	0	1	1	1	1	0
Baca-Garcia et al (2004)	SF	0.03	0.99	124	99	0	1	1	1	1	1
Baca-Garcia et al (2004)	SF	-0.13	0.87	124	99	0	1	1	1	1	2
Balodis et al (2007)	SF	0.06	1.00	29	37	4	0	0	0	1	0
Balodis et al (2007)	SF	0.22	0.72	29	37	4	0	0	0	1	1

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Balodis et al (2007)	SF	-0.10	0.91	29	37	4	0	0	0	1	2
Berlin et al (2005)	SF	-0.17	0.96	10	29	6	0	0	1	1	0
Berlin et al (2005)	SF	0.06	1.09	10	29	6	0	0	1	1	1
Berlin et al (2005)	SF	-0.17	0.47	10	29	6	0	0	1	1	2
Billieux et al (2008)	SF	0.41	0.90	74	76	4	1	1	2	1	6
Billieux et al (2008)	SF	0.09	0.90	74	76	4	1	1	2	1	7
Billieux et al (2008)	SF	-0.23	0.67	74	76	4	1	1	2	1	8
Bjork et al (2004)	SF	-0.05	1.03	27	14	5	1	0	1	1	0
Bjork et al (2004)	SF	-0.07	1.38	27	14	5	1	0	1	1	1
Bjork et al (2004)	SF	0.13	0.09	27	14	5	1	0	1	1	2
Caci et al (2003b)	SF	0.36	0.99	194	342	4	1	1	0	1	0
Caci et al (2003b)	SF	0.18	1.19	194	342	4	1	1	0	1	1
Caci et al (2003b)	SF	0.02	1.05	194	342	4	1	1	0	1	2
Caci et al (2003a)	SF	0.08	0.91	201	390	4	1	1	0	1	25
Calvete & Cardenoso (2005)	SF	0.36	0.90	365	491	2	0	1	3	1	35

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Casillas (2006)	SF	0.39		84	125	4	1	0	1	1	2
Casillas (2006)	SF	0.30		84	125	4	1	0	1	0	6
Casillas (2006)	SF	0		84	125	4	1	0	1	0	7
Casillas (2006)	SF	-0.10		84	125	4	1	0	1	0	8
Claes et al (2000)	SF	0.33		159	156	6	1	1	1	1	25
Clark et al (2005)	SF	0.75	0.90	27	13	4	1	1	1	1	0
Clark et al (2005)	SF	0.65	0.66	27	13	4	1	1	1	1	1
Clark et al (2005)	SF	0.61	0.55	27	13	4	1	1	1	1	2
Copping (2007)	SF	-0.20	0.68	94	104	1	1	1	3	0	6
Copping (2007)	SF	0	0.90	94	104	1	1	1	3	0	7
Copping (2007)	SF	-0.21	0.60	94	104	1	1	1	3	0	8
Cyders et al (2007)	SF	0.43	1.05	43	165	3	0	0	0	1	6
Cyders et al (2007)	SF	0	1.00	175	175	3	0	0	0	1	6
Cyders et al (2007)	SF	-0.14	0.76	168	147	3	0	0	0	1	6
Cyders et al (2007)	SF	-0.09	1.09	43	165	3	0	0	0	1	7

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Cyders et al (2007)	SF	-0.09	1.00	175	175	3	0	0	0	1	7
Cyders et al (2007)	SF	-0.07	0.83	168	147	3	0	0	0	1	7
Cyders et al (2007)	SF	0.05	1.23	175	175	3	0	0	0	1	8
Cyders et al (2007)	SF	0	1.11	168	147	3	0	0	0	1	8
Cyders et al (2007)	SF	0.15	1.00	43	165	3	0	0	0	1	8
d'Acrement & Van Der Linden (2005)	SF	0	0.99	314	314	2	1	1	3	1	6
d'Acrement & Van Der Linden (2005)	SF	0.08	0.92	314	314	2	1	1	3	1	7
d'Acrement & Van Der Linden (2005)	SF	-0.28	0.82	314	314	2	1	1	3	1	8
Davis et al (2002)	SF	0.11	0.93	104	107	4	1	0	0	1	26
de Wit et al (2007)	SF	0.06	1.08	303	303	6	0	0	1	1	0
de Wit et al (2007)	SF	-0.14	1.24	303	303	6	0	0	1	1	1
de Wit et al (2007)	SF	0.29	1.03	303	303	6	0	0	1	1	2
Dhuse (2006)	SF	-0.09		104	230	3	0	0	0	0	0
Dhuse (2006)	SF	0.06		104	230	3	0	0	0	0	1
Dhuse (2006)	SF	0.38		104	230	3	0	0	0	0	2

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Driscoll et al (2006)	SF	-0.37	1.02	221	386	2	0	1	3	1	26
D'zurilla et al (1998)	SF	0.32	1.03	405	499	3	1	0	2	1	35
D'zurilla et al (1998)	SF	0.10	0.98	30	70	6	1	0	2	1	35
D'zurilla et al (1998)	SF	0.06	0.88	30	70	6	1	0	2	1	35
Enticott et al (2006)	SF	-0.38	0.45	14	17	5	1	1	1	1	0
Enticott et al (2006)	SF	-0.14	1.52	14	17	5	1	1	1	1	1
Enticott et al (2006)	SF	-0.02	1.23	14	17	5	1	1	1	1	2
Flory et al (2006)	SF	0.23	1.17	154	197	6	0	0	1	1	0
Flory et al (2006)	SF	0.13	1.03	154	197	6	0	0	1	1	1
Flory et al (2006)	SF	0.44	1.08	154	197	6	0	0	1	1	2
Fossati et al (2004)	SF	-0.08	0.94	265	482	4	0	1	0	1	0
Fossati et al (2004)	SF	-0.08	1.15	265	482	4	0	1	0	1	1
Fossati et al (2004)	SF	-0.04	1.08	265	482	4	0	1	0	1	2
Fox et al (2007)	SF	0_a		26	24	0	0	0	1	1	26
Franken et al (2005)	SF	-0.29	0.49	14	21	4	1	1	2	1	25

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Fu et al (2007)	SF	0.02	1.00	1214	1248	3	2	2	0	1	1
Fu et al (2007)	SF	0.07	1.10	1214	1248	3	2	2	0	1	2
Galanti et al (2007)	SF	0.69		28	65	6	0	0	1	1	0
Galanti et al (2007)	SF	0.60		28	65	6	0	0	1	1	1
Justus et al (2001)	SF	-0.23	0.88	87	103	4	0	0	0	1	26
Kirkcaldy et al (1998)	SF	-0.81	0.72	55	56	1	1	1	3	1	26
Lehnart et al (1994)	SF	0.38	0.53	215	108	2	0	0	3	1	26
Lyke & Spinella (2004)	SF	0.29	0.82	32	80	4	0	0	1	1	0
Lyke & Spinella (2004)	SF	0.38	1.45	32	80	4	0	0	1	1	1
Lyke & Spinella (2004)	SF	0.05	2.13	32	80	4	0	0	1	1	2
Magid & Colder (2007)	SF	-0.24	1.21	131	136	3	0	0	0	1	6
Magid & Colder (2007)	SF	-0.04	1.12	131	136	3	0	0	0	1	7
Magid & Colder (2007)	SF	0.07	1.19	131	136	3	0	0	0	1	8
Maydeu-Olivares et al (2000)	SF	0_a		121	651	3	1	1	0	1	35
McAlister et al (2005)	SF	0.12		43	76	3	0	1	0	1	25

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Pfefferbaum et al (1994)	SF	0.30		148	148	3	0	0	0	1	26
Plastow (2007)	SF	-0.05	0.98	56	267	3	0	0	0	0	6
Plastow (2007)	SF	-0.02	1.44	56	267	3	0	0	0	0	7
Plastow (2007)	SF	-0.04	0.89	56	267	3	0	0	0	0	8
Pompili et al (2007)	SF	0.22	0.99	141	159	4	1	1	0	1	2
Ramadan & McMurran (2005)	SF	0.36	1.61	39	69	3	0	1	0	1	35
Rammsayer et al (2000)	SF	-0.23	0.66	25	35	4	1	1	0	1	25
Reeve (2007)	SF	0.05	0.78	72	125	3	1	0	0	1	25
Reto et al (1993)	SF	0.05	0.59	57	126	5	0	0	0	1	26
Rose (2007)	SF	0.32	0.87	89	148	3	1	0	0	1	26
Simons et al (2004)	SF	0.50	1.02	228	363	3	1	0	0	1	26
Spillane & Smith (2006a)	SF	-0.11	1.35	97	117	2	0	0	0	1	6
Spillane & Smith (2006a)	SF	0.05	1.99	97	117	2	0	0	0	1	7
Spillane & Smith (2006a)	SF	-0.40	1.73	97	117	2	0	0	0	1	8
Spillane & Smith (2006b)	SF	0.15	0.62	148	210	3	0	0	0	1	6

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Spillane & Smith (2006b)	SF	0.04	1.00	148	210	3	0	0	0	1	7
Spillane & Smith (2006b)	SF	0	0.93	148	210	3	0	0	0	1	8
Spinella (2005)	SF	0.45	0.81	49	49	4	1	0	1	1	0
Spinella (2005)	SF	-0.07	0.83	49	49	4	1	0	1	1	1
Spinella (2005)	SF	0.37	0.50	49	49	4	1	0	1	1	2
Stoltenberg et al (2008)	SF	0.50	1.55	72	120	4	1	0	0	1	0
Stoltenberg et al (2008)	SF	0.53	0.95	72	120	4	1	0	0	1	1
Stoltenberg et al (2008)	SF	0.39	1.11	72	120	4	1	0	0	1	2
Sullivan (1997)	SF	0.35	1.53	172	172	4	0	0	1	0	25
Van der Linden et al (2006)	SF	0.45	0.67	39	195	4	1	1	0	1	6
Van der Linden et al (2006)	SF	-0.10	0.49	39	195	4	1	1	0	1	7
Van der Linden et al (2006)	SF	-0.11	0.72	39	195	4	1	1	0	1	8
Verdejo-Garcia et al (2007)	SF	0[a]		14	22	5	1	1	1	1	6
Verdejo-Garcia et al (2007)	SF	0[a]		14	22	5	1	1	1	1	7
Verdejo-Garcia et al (2007)	SF	0[a]		14	22	5	1	1	1	1	8

Study	Domain	d	VR	NM	NF	Age	Author	Nationality	Population	Published	Category
Vigil - Colet & Cordorniu-Raga (2004)	SF	0.40	1.67	16	68	4	1	1	0	1	25
Vigil-Colet & Morales-Vives (2005)	SF	0.23	0.92	107	134	1	1	1	3	1	0
Vigil-Colet & Morales-Vives (2005)	SF	0.02	0.96	107	134	1	1	1	3	1	1
Vigil-Colet & Morales-Vives (2005)	SF	0	0.95	107	134	1	1	1	3	1	2
Vigil-Colet & Morales-Vives (2005)	SF	0.03	0.98	107	134	1	1	1	3	1	25
Vigil-Colet (2007)	SF	-0.30	0.88	18	77	4	1	1	0	1	25
Vigil-Colet et al (2008)	SF	0.02	1.03	208	114	5	1	1	1	1	25
Vigil-Colet et al (2008)	SF	0.21	0.75	72	150	4	1	1	0	1	25
Zuckerman et al (1988)	SF	0	1.42	73	198	0	1	0	0	1	26

Note: *d* = effect size; subscript *a* = effect size estimated as zero due to insufficient information; VR = Untransformed Variance Ratio; NM = *n* males; NF = *n* females

Domain: B = Behavioral Measures, GI = General Measures of Impulsivity, PS = Punishment Sensitivity, RS = Reward Sensitivity, SS/RT = Sensation Seeking and Risk Taking, SF = Specific Forms of Impulsivity

Age: 0 = Unspecified/ Wide age range, 1 = 10-15 years old, 2 = 15-18 years old, 3 = 18-21 years old, 4 = 21-30 years old, 5 = 30-40 years old, 6 = 40+ years old

Author = Sex of first author: 0 = Female, 1 = Male, 2 = Information not found

Nationality: 0 = US, Canada & Central America, 1 = UK, Europe, Australia/New Zealand, 2 = Asia, Africa & Middle East

Population: 0 = University Students (Including Undergraduates, College Students, and Post-Graduate Students), 1 = Community, 2 = Mixed, 3 = Schools (up to age 18), 4 = Not Specified

Published: 0 = Unpublished Study, 1 = Published Study

Category: 0 = BIS Cognitive Subscale (Barrett Impulsivity Scale), 1 = BIS Motor (Barrett Impulsivity Subscale), 2 = BIS Non Planning (Barrett Impulsivity Subscale), 3 = BART, 4 = Eysenck Impulsivity Measures (Including all versions of the Impulsivity Scale and Impulsivity from Eysenck Personality Inventory), 5 = Venturesomeness (Venturesomeness subscales from versions of the Eysenck Impulsivity Scale), 6 = UPPS Lack of Perseverance, 7 = UPPS Lack of Premeditation, 8 = UPPS Urgency, 9 = UPPS Sensation Seeking, 10 = Impulsivity Other Measures (General Impulsivity measures including study specific impulsivity measures and excluding Eysenck measures), 11 = Risk Taking (Scales representing risky behaviour or the propensity to engage in risky behaviour as well as Risky Impulsivity), 12 = Other Sensation Seeking Measures (Study specific Sensation Seeking measures or measures excluding the Zuckerman SSS and the UPPS Sensation Seeking Scale), 13 = SPSRQ/GRAPES Punishment Sensitivity, 14 = SPSRQ/GRAPES Reward Sensitivity, 15 = Delay Discounting, 16 = BAS Drive Subscale from BIS/BAS, 17 = BAS Fun Subscale from BIS/BAS, 18 = BAS Reward Subscale from BIS/BAS, 19 = BIS Total from BIS/BAS, 20= Boredom Susceptibility Subscale of Zuckerman SSS, 21 = Disinhibition Subscale of Zuckerman SSS, 22 = Experience Seeking Subscale of Zuckerman SSS, 23= Thrill and Adventure Seeking Subscale of Zuckerman SSS, 24 = Functional Impulsivity (Dickman Scales), 25 = Dysfunctional Impulsivity (Dickman Scales), 26 = Impulse Control (Measures of the ability to control impulses/urges), 27 = Iowa Gambling Task, 28 = KSP Impulsivity Subscales, 29 = Total of Barrett Impulsivity Scale (BIS Total), 30 = Total of Zuckerman SSS (SSS Total), 31 = BAS Total from BIS/BAS, 32 = TPQ/TCI Reward Dependence, 33 = MPQ/PRF Harm Avoidance, 34 = ZKPQ Impulsive Sensation Seeking (ImpSS), 35 = Social Problem Solving Inventory (SPSI), Impulsive/Careless style score 36, TPQ/TCI Harm Avoidance, 37 = KSP Monotony Avoidance, 38 = Visual-Cognitive Tasks, 39 = Executive response inhibition tasks: Stop Task/Go-no-go task/Stroop tasks/Continuous Performance Test.

APPENDIX B

References Used in the Meta-Analysis

Abramowitz, A., & Berenbaum, H. (2007). Emotional triggers and their relation to impulsive and compulsive psychopathology. *Personality and Individual Differences, 43,* 1356–1365. doi:10.1016/j.paid.2007.04.004

Acheson, A., Richards, J. B., & de Wit, H. (2007). Effects of sleep deprivation on impulsive behaviors in men and women. *Physiology & Behavior, 91,* 579–587. doi:10.1016/j.physbeh.2007.03.020

Adams, C. D., Kelley, M. C., & McCarthy, M. (1997). The Adolescent Behavior Checklist: Development and initial psychometric properties of a self-report measure for adolescents with ADHD. *Journal of Clinical Child Psychology, 26,* 77–86. doi:10.1207/s15374424jccp2601_8

af Klinteberg, B. A., Schalling, D., Edman, G., Oreland, L., & Asberry, M. (1987). Personality correlates of platelet Monoamine Oxidase (MAO) activity in female and male subjects. *Neuropsychobiology, 18,* 89–96. doi:10.1159/000118399

Aidman, E. V., & Kollaras-Mitsinikos, L. (2006). Personality dispositions in the prediction of posttraumatic stress reactions. *Psychological Reports, 99,* 569–580. doi:10.2466/PR0.99.6.569-580

Aklin, W. M., Lejuez, C. W., Zvolensky, M. J., Kahler, C. W., & Gwadz, M. (2005). Evaluation of behavioural measures of risk taking propensity with inner city adolescents. *Behaviour Research and Therapy, 43,* 215–228. doi:10.1016/j.brat.2003.12.007

Alexander, F., Allen, C., Brooks, J., Cole, C., & Campbell, A. (2004). Reason to believe: Representations of aggression as phenomenological read-out. *Sex Roles, 51,* 647–659. doi:10.1007/s11199-004-0716-z

Allen, T. J., Moeller, F. G., Rhoades, H. M., & Cherek, D. R. (1998). Impulsivity and history of drug dependence. *Drug and Alcohol Dependence, 50,* 137–145. doi:10.1016/S0376-8716(98)00023-4

Alter, C. E. (2001). Creativity styles and personality characteristics. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 62, (1-B),* 590.

Aluja, A., & Blanch, A. (2007). Comparison of impulsiveness, venturesomeness and empathy (I-sub-7) structure in English and Spanish samples: Analysis of different structural equation models. *Personality and Individual Differences, 43,* 2294–2305. doi:10.1016/j.paid.2007.07.019

Anderson, K. L. (1986). Androgyny, flexibility and individualism. *Journal of Personality Assessment, 50,* 265–278. doi:10.1207/s15327752jpa5002_13

Anestis, M. D., Selby, E. A., & Joiner, T. E. (2007). The role of urgency in maladaptive behaviors. *Behaviour Research and Therapy, 45,* 3018–3029. doi:10.1016/j.brat.2007.08.012

Antonowicz, D. H. (2002). Hostile attributional biases, driving anger, and roadway aggression among university students: Application of a model of affective aggression. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 63, (4-B),* 2099.

Archer, J., Kilpatrick, G., & Bramwell, R. (1995). Comparison of two aggression inventories. *Aggressive Behavior, 21,* 371–380. doi:10.1002/1098-2337(1995)21:5<371::AID-AB2480210506>3.0.CO;2-P

Archer, J., & Webb, I. A. (2006). The relation between scores on the Buss-Perry aggression questionnaire and aggressive acts, impulsiveness, competitiveness, dominance and sexual jealousy. *Aggressive Behavior, 32,* 464–473. doi:10.1002/ab.20146

Avila, C., & Parcet, M. A. (2000). The role of Gray’s impulsivity in anxiety-mediated differences in resistance to extinction. *European Journal of Personality, 14,* 185–198. doi:10.1002/1099-0984(200005/06)14:3<185::AID-PER370>3.0.CO;2-U

Baca-García, E., Oquendo, M. A., Saiz-Ruiz, J., Mann, J. J., & de Leon, J. (2006). A pilot study on differences in aggression in New York City and Madrid, Spain, and their possible impact on suicidal behaviour. *Journal of Clinical Psychiatry, 67,* 375–380. doi:10.4088/JCP.v67n0306

Baca-García, E., Vaquero, C., Diaz-Sastre, C., García-Resa, E., Saiz-Ruiz, J., Fernández-Piqueras, J., & de Leon, J. (2004). Lack of association between the serotonin transporter promoter gene polymorphism and impulsivity or aggressive behaviour among suicide attempters and healthy volunteers. *Psychiatry Research, 126,* 99–106. doi:10.1016/j.psychres.2003.10.007

Bagge, C., Nickell, A., Stepp, S., Durrett, C., Jackson, K., & Trull, T. J. (2004). Borderline personality disorder features predict negative outcomes 2 years later. *Journal of Abnormal Psychology, 113,* 279–288. doi:10.1037/0021-843X.113.2.279

Baker, F., Johnson, M. W., & Bickel, W. K. (2003). Delay discounting in current and never-before cigarette smokers: Similarities and differences across commodity, sign, and magnitude. *Journal of Abnormal Psychology, 112,* 382–392. doi:10.1037/0021-843X.112.3.382

Baker, J. R., & Yardley, J. K. (2002). Moderating effect of gender on the relationship between sensation seeking-impulsivity and substance use in adolescents. *Journal of Child and Adolescent Substance Abuse, 12,* 27–43. doi:10.1300/J029v12n01_02

Balodis, I. M., Johnsrude, I. S., & Olmstead, M. C. (2007). Intact preference conditioning in acute intoxication despite deficient declarative knowledge and working memory. *Alcoholism: Clinical and Experimental Research, 31,* 1800–1810. doi:10.1111/j.1530-0277.2007.00482.x

Bare, R. L. (2006). Psychopathic traits in college students: Electrodermal reactivity, anxiety, disinhibition, risk-taking, and executive functioning. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 67, (2-B),* 1140.

Bates, M. E., & Labouvie, E. W. (1995). Personality-environment constellations and alcohol use: A process oriented study of intraindividual change during adolescence. *Psychology of Addictive Behaviours, 9,* 23–35. doi:10.1037/0893-164X.9.1.23

Bazargan-Hejazi, S., Gaines, T., Duan, N., & Cherpitel, C. J. (2007). Correlates of injury among ED visits: Effects of alcohol, risk perception, impulsivity and sensation seeking behaviors. *American Journal of Drug and Alcohol Abuse, 33,* 101–108. doi:10.1080/00952990601087455

Bembenutty, H., & Karabenick, S. A. (1998). Academic delay of gratification. *Learning and Individual Differences, 10,* 329–346. doi:10.1016/S1041-6080(99)80126-5

Berlin, H. A., Rolls, E. T., & Iversen, S. D. (2005). Borderline personality disorder, impulsivity, and the orbitofrontal cortex. *American Journal of Psychiatry, 162,* 2360–2373. doi:10.1176/appi.ajp.162.12.2360

Billieux, J., Rochat, L., Rebetez, M. M. L., & Van der Linden, M. (2008). Are all facets of impulsivity related to self-reported compulsive buying behaviour? *Personality and Individual Differences, 44,* 1432–1442. doi:10.1016/j.paid.2007.12.011

Bjork, J. M., Hommer, D. W., Grant, S. J., & Danube, C. (2004). Impulsivity in abstinent alcohol-dependent patients: Relation to control subjects and type 1-/type 2-like traits. *Alcohol, 34,* 133–150. doi:10.1016/j.alcohol.2004.06.012

Brezo, J., Paris, J., Tremblay, R., Vitaro, F., Zoccolillo, M., & Herbert, M. et al. (2006). Personality traits as correlates of suicide attempts and suicidal ideation in young adults. *Psychological Medicine, 36,* 191–202. doi:10.1017/S0033291705006719

Brown, S. M., Manuck, S. B., Flory, J. D., & Hariri, A. R. (2006). Neural basis of individual differences in impulsivity: Contributions of corticolimbic circuits for behavioural arousal and control. *Emotion, 6,* 239–245. doi:10.1037/1528-3542.6.2.239

Caci, H., Deschaux, O., & Bayle, F. J. (2007). Psychometric properties of the French versions of the BIS/BAS scales and the SPSRQ. *Personality and Individual Differences, 42,* 987–998. doi:10.1016/j.paid.2006.09.008

Caci, H., Nadalet, L., Baylé. F. J, Robert, P., & Boyer, P. (2003a). Functional and dysfunctional impulsivity: Contribution to the construct validity. *Acta Psychiatrica Scandinavica*, *107*, (1), 34–40. doi:10.1034/j.1600-0447.2003.01464.x

Caci, H., Nadalet, L., Baylé. F. J, Robert, P., & Boyer, P. (2003b). Cross-cultural study of the Impulsiveness-Venturesomeness-Empathy questionnaire (IVE-7). *Comprehensive Psychiatry*, 44, 381–387. doi:10.1016/S0010-440X(03)00105-6

Calvete, E., & Cardenoso, O. (2005). Gender differences in cognitive vulnerability to depression and behaviour problems in adolescents. *Journal of Abnormal Child Psychology, 33,* 179–192. doi:10.1007/s10802-005-1826-y

Camatta, C. D., & Nagoshi, C. T. (1995). Stress, depression, irrational beliefs and alcohol use and problems in a college student sample. *Alcoholism: Clinical and Experimental Research, 19,* -142-146 doi:10.1111/j.1530-0277.1995.tb01482.x

Case, S. (2007). Indicators of adolescent alcohol use: A composite risk factor approach. *Substance Use and Misuse, 42,* 89–111. doi:10.1080/10826080601094280

Caseras, X., Avila, C., & Torrubia, R. (2003). The measurement of individual differences in Behavioural Inhibition and Behavioural Activation Systems: A comparison of personality scales. *Personality and Individual Differences, 34, (6),* 999–1013. doi:10.1016/S0191-8869(02)00084-3

Casillas, A. (2006). Personality and neuropsychological correlates of impulsivity. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 66, (8-B*), 4476.

Chabrol, H., Montovany, A., Ducongé, E., Kallmeyer, A., Mullet, E., & Leichsenring, F. (2004). Factor structure of the Borderline Personality Inventory in adolescents. *European Journal of Psychological Assessment, 20,* 59–65. doi:10.1027/1015-5759.20.1.59

Chen, A. C. H., Porjesz, B., Rangaswamy, M., Kamarajan, C., Tang, Y., Jones, K. A., et al. (2007). Reduced frontal lobe activity in subjects with high impulsivity and alcoholism. *Alcoholism: Clinical and Experimental Research, 31,* 156–165. doi:10.1111/j.1530-0277.2006.00277.x

Cherpitel, C. J. (1993). Alcohol, injury and risk taking behavior: Data from a national sample. *Alcoholism: Clinical and Experimental Research, 17,* 762–766. doi:10.1111/j.1530-0277.1993.tb00837.x

Chung, T., & Martin, C. S. (2002). Concurrent and discriminant validity of DSM-IV symptoms of impaired control over alcohol consumption in adolescents. *Alcoholism: Clinical and Experimental Research, 26,* 485–492. doi:10.1111/j.1530-0277.2002.tb02565.x

Claes, L., Vertommen, H., & Braspenning, N. (2000). Psychometric properties of the Dickman Impulsivity Inventory. *Personality and Individual Differences, 29,* 27–35. doi:10.1016/S0191-8869(99)00172-5

Clark, L., Roiser, J. P., Cools, R., Rubinsztein, D. C., Sahakian, B. J., & Robbins, T. W. (2005). Stop signal response inhibition is not modulated by tryptophan depletion or the serotonin transporter polymorphism in healthy volunteers: Implications for the 5-HT theory of impulsivity. *Psychopharmacology, 182,* 570–578. doi:10.1007/s00213-005-0104-6

Clarke, D. (2004). Impulsiveness, locus of control, motivation and problem gambling. *Journal of Gambling Studies, 20,* 319–345. doi:10.1007/s10899-004-4578-7

Clarke, D. (2006). Impulsivity as a mediator in the relationship between depression and problem gambling. *Personality and Individual Differences, 40,* 5–15. doi:10.1016/j.paid.2005.05.008

Clift, S. M., Wilkins, J. C., & Davidson, E. A. F. (1993). Impulsiveness, venturesomeness and sexual risk-taking among heterosexual GUM clinic attenders. *Personality and Individual Differences, 15,* 403–410. doi:10.1016/0191-8869(93)90068-E

Colder, C. R., & Stice, E. (1998). A longitudinal study of the interactive effects of impulsivity and anger on adolescent problem behavior. *Journal of Youth and Adolescence, 27,* 255–274. doi:10.1023/A:1022889202419

Colom, R., Escorial, S., Shih, P. C., & Privado, J. (2007). Fluid intelligence, memory span, and temperament difficulties predict academic performance of young adolescents. *Personality and Individual Differences, 42,* 1503–1514. doi:10.1016/j.paid.2006.10.023

Compton, M. T., & Kaslow, N. J. (2005). Self-reported psychotic symptoms predict impulsivity among African-American patients in an urban non-psychiatric medical setting. *Psychiatry Research, 135,* 35–44. doi:10.1016/j.psychres.2005.03.004

Cooper, M. L., Agocha, V. B., & Sheldon, M. S. (2000). A motivational perspective on risky behaviors: The role of personality and affect regulatory processes. *Journal of Personality, 68,* 1059–1088. doi:10.1111/1467-6494.00126

Cooper, M. L., Wood, P. K; Orcutt, H. K., & Albino, A. (2003). Personality and the predisposition to engage in risky or problem behaviors during adolescence. *Journal of Personality and Social Psychology, 84,* 390–410. doi:10.1037/0022-3514.84.2.390

Copping, L. T. (2007). Social class and social representation: Is impulsivity the mediator? *Unpublished Dissertation.*

Corr, P. J., Pickering, A. D., & Gray, J. A. (1995). Sociability/impulsivity and caffeine arousal: Critical flicker/fusion frequency and procedural learning. *Personality and Individual Differences, 18,* 713–730. doi:10.1016/0191-8869(95)00001-M

Corulla, W. J. (1987). Psychometric investigation of the Eysenck Personality Questionnaire (Revised) and its relationship to the I7 Impulsiveness Questionnaire. *Personality and Individual Differences, 8,* 651–658. doi:10.1016/0191-8869(87)90062-6

Cross, C. P. (2007, September). *Risky impulsivity predicts sexual and aggressive behaviour in undergraduates.* Poster presented at the meeting of the Association for the Study of Animal Behaviour, Newcastle University.

Cross, C. P. (2008, March). *Individual differences in sexual and aggressive behaviour: The role of risky impulsivity.* Paper presented at the first biennial conference of the International Family Aggression Society, University of Central Lancashire.

Cross, C. P. (2009). *Sex differences in aggression and sociosexuality: The role of risky impulsivity.* Manuscript submitted for publication.

Curran, M. F. (2006). Risk taking as a contributing factor to driving while under the influence of alcohol. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 67, (3-B),* 1741.

Curry, L. A. (2005). Affect, decision making, and adolescent risk behavior. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 65, (12-B),* 6685.

Curry, T. R., & Piquero, A. R. (2003). Control ratios and defiant acts of deviance: Assessing additive and conditional effects with constraints and impulsivity. *Sociological Perspectives, 46,* 397–415. doi:10.1525/sop.2003.46.3.397

Cyders, M. A., Smith, G. T., Spillane, N. S., Fischer, S., Annus, A. M., & Peterson, C. (2007). Integration of impulsivity and positive mood to predict risky behaviour: Development and validation of a measure of positive urgency. *Psychological Assessment, 19,* 107–118. doi:10.1037/1040-3590.19.1.107

d'Acremont, M., & Van der Linden, M. (2005). Adolescent impulsivity: Findings from a community sample. *Journal of Youth and Adolescence, 34,* 427–435. doi:10.1007/s10964-005-7260-1

Dahlen, E. R., Martin, R. C., Ragan, K., & Kuhlman, M. M. (2004). Boredom proneness in anger and aggression: Effects of impulsiveness and sensation seeking. *Personality and Individual Differences, 37,* 1615–1627. doi:10.1016/j.paid.2004.02.016

Dahlen, E. R., Martin, R. C., Ragan, K., & Kuhlman, M. M. (2005). Driving anger, sensation seeking, impulsiveness, and boredom proneness in the prediction of unsafe driving. *Accident Analysis and Prevention, 37,* 341–348. doi:10.1016/j.aap.2004.10.006

Davelaar, P. M., Araujo, F. S., & Kipper, D. A. (2008). The Revised Spontaneity Assessment Inventory (SAI-R): Relationship to goal orientation, motivation, perceived self-efficacy and self-esteem. *The Arts in Psychotherapy, 35,* 117–128. doi:10.1016/j.aip.2008.01.003

Davis, C., Patte, K., Tweed, S., & Curtis, C. (2007). Personality traits associated with decision-making deficits. *Personality and Individual Differences, 42,* 279–290. doi:10.1016/j.paid.2006.07.006

Davis, R. A., Flett, G. L., & Besser, A. (2002). Validation of a new scale for measuring problematic Internet use: Implications for pre-employment screening. *CyberPsychology & Behavior, 5,* 331–345. doi:10.1089/109493102760275581

Deffenbacher, J. L., Filetti, L. B., Richards, T. L., Lynch, R. S., & Oetting, E. R. (2003). Characteristics of two groups of angry drivers. *Journal of Counselling Psychology, 50,* 123–132. doi:10.1037/0022-0167.50.2.123

De Flores, T., & Valdes, M. (1986). Behaviour pattern A: Reward, fight or punishment? *Personality and Individual Differences, 7,* 319–326. doi:10.1016/0191-8869(86)90007-3

DePasquale, J. P., Geller, E. S., Clarke, S. W., & Littleton, L. C. (2001). Measuring road rage: Development of the Propensity for Angry Driving Scale. *Journal of Safety Research, 32,* 1–16. doi:10.1016/S0022-4375(00)00050-5

de Wit, H., Engasser, J. L., & Richards, J. B. (2002). Acute administration of d-amphetamine decreases impulsivity in healthy volunteers. *Neuropsychopharmacology*, 27, 813–825. doi:10.1016/S0893-133X(02)00343-3

de Wit, H., Flory, J. D., Acheson, A., McCloskey, M., & Manuck, S. B. (2007). IQ and nonplanning impulsivity are independently associated with delay discounting in middle-aged adults. *Personality and Individual Differences, 42,* 111–121. doi:10.1016/j.paid.2006.06.026

Dhuse, S. R. (2006). Consequences of binge drinking: Risk and protective factors. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 67, (1-B),* 537.

Diaz, A., & Pickering, A. D. (1993). The relationship between Gray's and Eysenck's personality spaces. *Personality and Individual Differences, 15,* 297–305. doi:10.1016/0191-8869(93)90220-W

Dinn, W. M., Harris, C. L., Aycicegi, A., Greene, P., & Andover, M. S. (2002). Positive and negative schizotypy in a student sample: Neurocognitive and clinical correlates. *Schizophrenia Research, 56,* 171–185. doi:10.1016/S0920-9964(01)00230-4

Doran, N., McChargue, D., & Cohen, L. (2007). Impulsivity and the reinforcing value of cigarette smoking. *Addictive Behaviors, 32,* 90–98. doi:10.1016/j.addbeh.2006.03.023

Doran, N., Spring, B., & McChargue, D. (2007). Effect of impulsivity on craving and behavioural reactivity to smoking cues. *Psychopharmacology, 194,* 279–288. doi:10.1007/s00213-007-0832-x

D'Zurilla, T. J., Maydeu-Olivares, A., & Kant, G. L. (1998). Age and gender differences in social problem-solving ability. *Personality and Individual Differences, 25, (2),* 241–252. doi:10.1016/S0191-8869(98)00029-4

Driscoll, H., Zinkivskay, A., Evans, K., & Campbell, A. (2006). Gender differences in social representations of aggression: The phenomenological experience of differences in inhibitory control? *British Journal of Psychology, 97,* 139–153. doi:10.1348/000712605X63073

Durante, M. (2002). A logistic regression analysis of biodata and personality predictors of job retention among detention officers. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 63, (5-B),* 2579.

Enticott, P. G., Ogloff, J. R. P., & Bradshaw, J. L. (2006). Associations between laboratory measures of executive inhibitory control and self-reported impulsivity. *Personality and Individual Differences, 41,* 285–294. doi:10.1016/j.paid.2006.01.011

Epstein, J. N., Erkanli, A., Conners, C. K., Klaric, J., Costello, J. E., & Angold, A. (2003a). Relations between Continuous Performance Test performance measures and ADHD behaviors. *Journal of Abnormal Child Psychology, 31,* 543–554. doi:10.1023/A:1025405216339

Epstein, L. H., Richards, J. B., Saad, F. G., Paluch, R. A., Roemmich, J. N., & Lerman, C. (2003b). Comparison between two measures of delay discounting in smokers. *Experimental and Clinical Psychopharmacology, 11,* 131–138. doi:10.1037/1064-1297.11.2.131

Eysenck, S. B. G. (1981). Impulsiveness and antisocial behaviour in children. *Current Psychological Research, 1,* 31–37. doi:10.1007/BF02684423

Eysenck, S. B. G., & Abdel-Khalek, A. M. (1992). Cross cultural comparisons of the I7 Impulsiveness Scales for Egyptian and English adults. *European Journal of Psychological Assessment, 8,* 149–153.

Eysenck, S. B. G., Daum, I., Schugens, M. M., & Diehl, J. M. (1990). A cross cultural study of impulsiveness, venturesomeness and empathy: Germany and England. *Zeitschrift Fur Differentielle Und Diagnostiche Psychologie, 11,* 209–213.

Eysenck, S. B. G., & Jamieson, R. N. (1986). A cross cultural study of personality: American and English children. *Journal of Social Behavior and Personality, 1,* 199–208.

Eysenck, S. B. G., Pearson, P. R., Easting, G., & Allsopp, J. F. (1985). Age norms for impulsiveness, venturesomeness and empathy in adults. *Personality and Individual Differences, 6,* 613–619. doi:10.1016/0191-8869(85)90011-X

Fallgatter, A. J., & Herrmann, M. J. (2001). Electrophysiological assessment of impulsive behavior in healthy subjects. *Neuropsychologia, 39,* 328–333. doi:10.1016/S0028-3932(00)00115-9

Feldman, D. J. (1999). Haste and disinhibition: An analysis of impulsive cognitive style manifest in adult performance on neuropsychological measures. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 59, (11-B),* 6063.

Fingeret, M. C., Moeller, F. G., & Stotts, A. (2005). Gender differences among MDMA users on psychological and drug history. *Addictive Disorders and Their Treatment, 4,* 43–48. doi:10.1097/01.adt.0000146604.18946.97

Fischer, S., & Smith, G. T. (2004). Deliberation affects risk taking beyond sensation seeking. *Personality and Individual Differences, 36,* 527–537. doi:10.1016/S0191-8869(03)00112-0

Flannery, D. J., Vazsonyi, J. T., Torquati, J., & Fridrich, A. (1994). Ethnic and gender differences in risk for early adolescent substance use. *Journal of Youth and Adolescence, 23,* 195–213. doi:10.1007/BF01537445

Flora, R. L. (2007). Behavioral undercontrol and alcohol consumption. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 68, (1-B),* 620.

Flory, J. D., Harvey, P. D., Mitropoulou,V., New, A. S., Silverman, J. M., Siever, L. J., et al. (2006). Dispositional impulsivity in normal and abnormal samples. *Journal of Psychiatric Research, 40,* 438–447. doi:10.1016/j.jpsychires.2006.01.008

Ford, C. M. (1995). Psychosocial correlates of contraceptive and HIV/STD preventive behaviors among college students. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 55, (10-B),* 4590.

Fossati, A., Barratt, E. S., Acquarini, E., & Di Ceglie, A. (2002). Psychometric properties of an adolescent version of the Barratt Impulsiveness Scale-11 for a sample of Italian high school students. *Perceptual and Motor Skills, 95,* 621–635.

Fossati, A., Barratt, E. S., Carretta, I., Leonardi, B., Graziolia, F., & Maffeia, C. (2004). Predicting borderline and antisocial personality disorder features in nonclinical subjects using measures of impulsivity and aggressiveness. *Psychiatry Research, 125,* 161–170. doi:10.1016/j.psychres.2003.12.001

Fossati, A., Ceglie, A. Di., Acquarini, E., & Barratt, E. S. (2001). Psychometric properties of an Italian version of the Barratt Impulsiveness Scale-11 (BIS-11) in nonclinical subjects. *Journal of Clinical Psychology, 57,* 815–828. doi:10.1002/jclp.1051

Fox, H. C., Axelrod, S. R., Paliwal, P., Sleeper, J., & Sinha, R. (2007). Difficulties in emotion regulation and impulse control during cocaine abstinence. *Drug and Alcohol Dependence, 89,* 298–301. doi:10.1016/j.drugalcdep.2006.12.026

Franken, I. H. A., Nijs, I., & Van Strien, J. W. (2005). Impulsivity affects mismatch negativity (MMN) measures of preattentive auditory processing. *Biological Psychology, 70,* 161–167. doi:10.1016/j.biopsycho.2005.01.007

Fu, A-T., Ko, H-C., Wu, J. Y-W., Cherng, B-L., & Cheng, C-P. (2007). Impulsivity and expectancy in risk for alcohol use: Comparing male and female college students in Taiwan. *Addictive Behaviors, 32,* 1887–1896. doi:10.1016/j.addbeh.2007.01.003

Galanti, K., Gluck, M. E., & Geliebter, A. (2007). Test meal intake in obese binge eaters in relation to impulsivity and compulsivity. *International Journal of Eating Disorders, 40,* 727–732. doi:10.1002/eat.20441

Gargallo, B. (1993). Basic variables in reflection-impulsivity: A training programme to increase reflectivity. *European Journal of Psychology of Education, 8,* 151–167. doi:10.1007/BF03173159

Garland, T. A. (1999). The relationship between the diagnosis of ADHD in adults, gender and sensation seeking. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 60, (5-B*), 2338.

Giancola, P. R., & Parrott, D. J. (2005). Differential effects of past-year stimulant and sedative drug use on alcohol-related aggression. *Addictive Behaviors, 30,* 1535–1554. doi:10.1016/j.addbeh.2005.02.011

Glicksohn, J., & Nahari, G. (2007). Interacting personality traits? Smoking as a test case. *European Journal of Personality, 21,* 225–234. doi:10.1002/per.609

Goudriaan, A. E., Grekin, E. R., & Sher, J. (2007). Decision making and binge drinking: A longitudinal study. *Alcoholism: Clinical and Experimental Research, 31,* 928–938. doi:10.1111/j.1530-0277.2007.00378.x

Grano, N., Keltikangas-Jarvinen, L., Kouvonen, A., Puttonen, S., Viartanen, M., Vahtera, J., et al. (2007). Association of impulsivity with sleep duration and insomnia in an employee population. *Personality and Individual Differences, 43,* 307–318. doi:10.1016/j.paid.2006.11.022

Green, F. W. (1995). Trait impulsivity and sexual behaviors related to HIV transmission. *Dissertation Abstracts International: Section B: The Sciences and Engineering,* 56, (1-B), 557.

Gudjonsson, G. H., Einarsson, E., Bragason, O. O., & Sigurdsson, J. F. (2006). Personality predictors of self-reported offending in Icelandic students. *Psychology, Crime and Law, 12,* 383–393. doi:10.1080/10683160500056929

Gupta, U., & Gupta, B. S. (1998). Environmental schematization in men and women and its relation to certain personality variables. *Journal of the Indian Academy of Applied Psychology, 24, (1*–2), 99–104.

Hartman, M. L., & Rawson, H. E. (1992). Differences in and of correlates of sensation seeking in male and female athletes and non-athletes. *Personality and Individual Differences, 13,* 805–812. doi:10.1016/0191-8869(92)90054-S

Hawton, K., Rodham, K., Evans, E., & Weatherall, R. (2002). Deliberate self harm in adolescents: Self report survey in schools in England. *British Medical Journal, 325,* 1207–1211. doi:10.1136/bmj.325.7374.1207

Heaven, P. C. L. (1989). Orientation to authority and its relation to impulsiveness. *Current Psychology: Research and Reviews, 8,* 38–45. doi:10.1007/BF02686736

Heaven, P. C. L. (1991). Venturesomeness, impulsiveness and Eysenck's personality dimensions: A study among Australian adolescents. *Journal of Genetic Psychology, 152,* 91–99. doi:10.1080/00221325.1991.9914681

Heerey, E. A., Robinson, B. M., McMahon, R. R., & Gold, J. M. (2007). Delay discounting in schizophrenia. *Cognitive Neuropsychiatry, 12, (3),* 213–221. doi:10.1080/13546800601005900

Henle, C. A. (2005). Predicting workplace deviance from the interaction between organizational justice and personality. *Journal of Managerial Issues, 17,* 247–263.

Herba, C. M., Tranah, T., Rubia, K., & Yule, W. (2006). Conduct problems in adolescence: Three domains of inhibition and effect of gender. *Developmental Neuropsychology, 30,* 659–695. doi:10.1207/s15326942dn3002_2

Hewlett, P., & Smith, A. (2006). Correlates of daily caffeine consumption. *Appetite, 46,* 97–99. doi:10.1016/j.appet.2005.10.004

Hulsey, C. D. (2001). Predictors of problem gambling among college students. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 61, (7-B*), 3847.

Hunt, M. K., Hopko, D. R., Bare, R., Lejuez, C. W., & Robinson, E. V. (2005). Construct validity of the Balloon Analog Risk Task (BART): Associations with psychopathy and impulsivity. *Assessment, 12,* 416–428. doi:10.1177/1073191105278740

Hutchinson, G. T., Patock-Peckham, J. A., Cheong, J., & Nagoshi, C. T. (1998). Irrational beliefs and behavioral misregulation in the role of alcohol abuse among college students. *Journal of Rational-Emotive and Cognitive Behavior Therapy, 16,* 61–74. doi:10.1023/A:1024950407778

Jack, S. J., & Ronan, K. R. (1998). Sensation seeking among high- and low-risk sports participants. *Personality and Individual Differences, 25,* 1063–1083. doi:10.1016/S0191-8869(98)00081-6

Jackson, C. P., & Matthews, G. (1988). The prediction of habitual alcohol use from alcohol related expectancies and personality. *Alcohol and Alcoholism, 23,* 305–314.

January, E. W. (2003). Young adult offspring of divorced/separated parents: An investigation of their needs for control, structure, and order. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 64, (3-B),* 1494.

Johnson, M. W., Bickel, W. K., & Baker, F. (2007). Moderate drug use and delay discounting: A comparison of heavy, light, and never smokers. *Experimental and Clinical Psychopharmacology, 15,* 187–194. doi:10.1037/1064-1297.15.2.187

Jollant, F., Bellivier, F., Leboyer, M., Astruc, B., Torres, S., Verdier, R., et al. (2005). Impaired decision making in suicide attempters. *American Journal of Psychiatry, 162,* 304–310. doi:10.1176/appi.ajp.162.2.304

Justus, A. N., Finn, P. R., & Steinmetz, J. E. (2001). P300, disinhibited personality, and early-onset alcohol problems. *Alcoholism: Clinical and Experimental Research, 25,* 1457–1466. doi:10.1111/j.1530-0277.2001.tb02147.x

Kazemi, D. M. (2007). Problematic drinking among college students: The role of impulsivity and resistance to change. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 68, (3-B),* 1591.

Keilp, J. G., Sackeim, H. A., & Mann, J. J. (2005). Correlates of trait impulsiveness in performance measures and neuropsychological tests. *Psychiatry Research, 135,* 191–201. doi:10.1016/j.psychres.2005.03.006

Ketzenberger, K. E., & Forrest, L. (2000). Impulsiveness and compulsiveness in alcoholics and nonalcoholics. *Addictive Behaviors, 25,* 791–795. doi:10.1016/S0306-4603(00)00062-9

Kirby, K. N., Godoy, R., Reyes-Garcia, V., Byron, E., Apaza, L., Leonard, W., et al. (2002). Correlates of delay-discount rates: Evidence from Tsimane' Amerindians of the Bolivian rain forest. *Journal of Economic Psychology, 23,* 291–316. doi:10.1016/S0167-4870(02)00078-8

Kirby, K. N., & Petry, N. M. (2004). Heroin and cocaine abusers have higher discount rates for delayed rewards than alcoholics or non-drug-using controls. *Addiction, 99,* 461–471. doi:10.1111/j.1360-0443.2003.00669.x

Kirby, K. N., Winston, G. C., & Santiesteban, M. (2005). Impatience and grades: Delay-discount rates correlate negatively with college GPA. *Learning and Individual Differences, 15,* 213–222. doi:10.1016/j.lindif.2005.01.003

Kirkcaldy, B. D., Eysenck, M., Furnham, A. F., & Siefen, G. (1998). Gender, anxiety and self-image. *Personality and Individual Differences, 24,* 677–684. doi:10.1016/S0191-8869(97)00226-2

Kollins, S. H. (2003). Delay discounting is associated with substance use in college students. *Addictive Behaviors, 28,* 1167–1173. doi:10.1016/S0306-4603(02)00220-4

Krueger, R. F., Markon, K. E., Patrick, C. J., Benning, S. D., & Kramer, M. D. (2007). Linking antisocial behaviour, substance use, and personality: An integrative quantitative model of the adult externalizing spectrum. *Journal of Abnormal Psychology, 116,* 645–666. doi:10.1037/0021-843X.116.4.645

Lehnert, K. L., Overhober, J. C., & Spiritio, A. (1994). Internalized and externalized anger in adolescent suicide attempters. *Journal of Adolescent Research, 9,* 105–119. doi:10.1177/074355489491008

Lejuez, C. W., Aklin, W. M., Jones, H. A., Richards, J. B., Strong, D. R., Kahler, C. W. et al. (2003). The balloon analogue risk task (BART) differentiates smokers and nonsmokers. *Experimental and Clinical Psychopharmacology, 11,* 26–33. doi:10.1037/1064-1297.11.1.26

Lejuez, C. W., Read, J. P., Kahler, C. W., Richards, J. B., Ramsey, S. E., Stuart, G. L., et al. (2002). Evaluation of a behavioral measure of risk taking: The Balloon Analogue Risk Task. *Journal of Experimental Psychology: Applied, 8,* 75–84. doi:10.1037/1076-898X.8.2.75

Lennings, C. J. (1991). The Schalling Sensation Seeking and Impulsivity Scales: Their relationship to time perspective and time awareness. A preliminary report. *Psychological Reports, 69,* 131–136. doi:10.2466/PR0.69.5.131-136

Lennings, C. J., & Burns, A. M. (1998). Time perspective: Temporal extension, time estimation, and impulsivity. *Journal of Psychology: Interdisciplinary and Applied, 132,* 367–380. doi:10.1080/00223989809599271

Leshem, R., & Glicksohn, J. (2007). The construct of impulsivity revisited. *Personality and Individual Differences, 43,* 681–691. doi:10.1016/j.paid.2007.01.015

Li, C.-S. R., & Chen, S-H. (2007). Obsessive-compulsiveness and impulsivity in a non-clinical population of adolescent males and females. *Psychiatry Research, 149,* 129–138. doi:10.1016/j.psychres.2006.05.001

Li, C.-S. R., Huang, C-Y., & Sun, C-W. V. (2007). Gender differences in punishment and reward sensitivity in a sample of Taiwanese college students. *Personality and Individual Differences, 43,* 475–483. doi:10.1016/j.paid.2006.12.016

Lijffijt, M., Caci, H., & Kenemans, J. L. (2005). Validation of the Dutch translation of the I7 questionnaire. *Personality and Individual Differences, 38,* 1123–1133. doi:10.1016/j.paid.2004.07.010

Llorente, M., & Torrubia, R. (1988). Type A behaviour patterns and personality variables: The correlations of impulsivity and anxiety as compared to extraversion and neuroticism. *European Journal of Psychiatry, 2,* 38–45.

Lonczak, H. S., Neighbors, C., & Donovan, D. M. (2007). Predicting risky and angry driving as a function of gender. *Accident Analysis and Prevention, 39,* 536–545. doi:10.1016/j.aap.2006.09.010

Lopez Viets, V. C. (2001). Psychosocial variables and college student gambling. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 61, (7-B),* 3850.

Luengo, M. A., Carrillo-de-la-Pena, M. T., & Otero, J. M. (1990). The components of impulsiveness: A comparison of the I7 Impulsiveness Questionnaire and the Barratt Impulsiveness Scale. *Personality and Individual Differences, 12,* 657–667 doi:10.1016/0191-8869(91)90220-6

Lundahl, L. H. (1995). Separation of the effects of family history of alcoholism, heavy drinking, and gender on personality functioning and sensitivity to alcohol in college students. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 56, (5-B),* 2874.

Lyke, J. A., & Spinella, M. (2004). Associations among aspects of impulsivity and eating factors in a nonclinical sample. *International Journal of Eating Disorders, 36,* 229–233. doi:10.1002/eat.20025

Macpherson, J., Sternhagen, S., Miller, T., Devitt, M., Petros, T. V., & Beckwith, B. (1996). Effect of caffeine, impulsivity and gender on the components of text processing and recall. *Experimental and Clinical Psychopharmacology, 4,* 438–446. doi:10.1037/1064-1297.4.4.438

Magid, V., & Colder, C. R.. (2007). The UPPS Impulsive Behavior Scale: Factor structure and associations with college drinking. *Personality and Individual Differences, 43,* 1927–1937. doi:10.1016/j.paid.2007.06.013

Magid, V., MacLean, M. G., & Colder, C. R. (2007). Differentiating between sensation seeking and impulsivity through their mediated relations with alcohol use and problems. *Addictive Behaviors, 32,* 2046–2061. doi:10.1016/j.addbeh.2007.01.015

Malle, B. F., & Neubauer, A. C. (1991). Impulsivity, reflection, and questionnaire response latencies: No evidence for a broad impulsivity trait. *Personality and Individual Differences, 12,* 865–871. doi:10.1016/0191-8869(91)90153-3

Mallet, P., & Vignoli, E. (2007). Intensity seeking and novelty seeking: Their relationship to adolescent risk behaviour and occupational interests. *Personality and Individual Differences, 43,* 2011–2021. doi:10.1016/j.paid.2007.06.018

Manuck, S. B., Flory, J. D., McCaffery, J. M., Matthews, K. A., Mann, J. J., & Muldoon, M. F. (1998). Aggression, impulsivity, and central nervous system serotonergic responsivity in a nonpatient sample. *Neuropsychopharmacology, 19,* 287–299.

Maras, P., Brosnan, M., Faulkner, N., Montgomery, T., & Vital, P. (2006). ‘They are out of control’: Self-perceptions, risk-taking and attributional style of adolescents with

SEBDs. *Emotional & Behavioural Difficulties, 11,* 281–298. doi:10.1080/13632750601043861

Marczinski, C. A., Combs, S. W., & Fillmore, M. T. (2007). Increased sensitivity to the disinhibiting effects of alcohol in binge drinkers. *Psychology of Addictive Behaviors, 21,* 346–354. doi:10.1037/0893-164X.21.3.346

Matczak, A. (1990). Reflection-impulsivity: Need for stimulation and intellectual potentialities. *Polish Psychological Bulletin, 21,* 17–25.

Maydeu-Olivares, A., Rodriguez-Fornells, A., Gomez-Benito, J., & D'Zurilla, T. J. (2000). Psychometric properties of the Spanish adaptation of the Social Problem-Solving Inventory-Revised (SPSI-R). *Personality and Individual Differences, 29,* 699–708. doi:10.1016/S0191-8869(99)00226-3

McAlister, A. R., Pachana, N., & Jackson, C. J. (2005). Predictors of young dating adults' inclination to engage in extradyadic sexual activities: A multi-perspective study. *British Journal of Psychology, 96,* 331–350. doi:10.1348/000712605X47936

McCrae, R. R., & Costa, P. T. (1985). Comparison of EPI and psychoticism with measures of the five-factor model of personality. *Personality and Individual Differences, 6,* 587–597. doi:10.1016/0191-8869(85)90008-X

McDaniel, S. R., & Zuckerman, M. (2003). The relationship of impulsive sensation seeking and gender to interest and participation in gambling activities. *Personality and Individual Differences, 35,* 1385–1400. doi:10.1016/S0191-8869(02)00357-4

McFatter, R. M. (1998). Emotional intensity: Some components and their relations to extraversion and neuroticism. *Personality and Individual Differences, 24,* 747–758. doi:10.1016/S0191-8869(97)00220-1

McLeish, K. N., & Oxoby, R. J. (2007). Measuring impatience: Elicited discount rates and the Barratt Impulsiveness Scale. *Personality and Individual Differences, 43,* 553–565. doi:10.1016/j.paid.2007.01.002

McMahon, S. D., & Washburn, J. J. (2003). Violence prevention: An evaluation of program effects with urban African American students. *Journal of Primary Prevention, 24,* 43–62. doi:10.1023/A:1025075617356

Meadows, W. R. (1995). The role of individual difference variables in accounting for associations between alcohol consumption and sexual risk-taking. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 56*(12-B), 7050.

Mehrabian, A. (2000). Beyond IQ: Broad-based measurement of individual success potential or “emotional intelligence.” *Genetic, Social, and General Psychology Monographs, 126,* 133–239.

Mejia, R., Kliewer, W., & Williams, L. (2006). Domestic violence exposure in Columbian adolescents: Pathways to violent and prosocial behaviour. *Journal of Traumatic Stress, 19,* 257–267. doi:10.1002/jts.20116

Molto, J., Segarra, P., & Avila, C. (1993). Impulsivity and total response speed to a personality questionnaire. *Personality and Individual Differences, 15,* 97–98. doi:10.1016/0191-8869(93)90047-7

Nagoshi, C. T. (1999). Perceived control of drinking and other predictors of alcohol use and problems in a college student sample. *Addiction Research, 7,* 291–306. doi:10.3109/16066359909004388

Nagoshi, C. T., Wood, M. D., Cote, C. C., & Abbit, S. M. (1994). College drinking game participation within the context of other predictors of alcohol use and problems. *Psychology of Addictive Behaviors, 8,* 203–213. doi:10.1037/0893-164X.8.4.203

Neal, D. J., & Carey, K. B. (2007). Association between alcohol intoxication and alcohol-related problems: An event-level analysis. *Psychology of Addictive Behaviors, 21,* 194–204. doi:10.1037/0893-164X.21.2.194

Neubauer, A. C. (1992). Psychometric comparison of two circadian rhythm questionnaires and their relationship with personality. *Personality and Individual Differences, 13,* 125–131. doi:10.1016/0191-8869(92)90035-N

Ng, H. S., Cooper, M., & Chandler, P. (1998). The Eysenckian personality structure: A "Giant Three" or "Big Five" model in Hong Kong? *Personality and Individual Differences, 25,* 1111–1131. doi:10.1016/S0191-8869(98)00106-8

Nietfeld, J., & Bosma, A. (2003). Examining the self-regulation of impulsive and reflective response styles on academic tasks. *Journal of Research in Personality, 37,* 118–140. doi:10.1016/S0092-6566(02)00564-0

Nijs, I. M. T., Franken, I. H. A., & Smulders, F. T. Y. (2007). BIS/BAS sensitivity and P300 event-related brain potential. *Journal of Psychophysiology, 21,* 83–90. doi:10.1027/0269-8803.21.2.83

Nower, L., Derevensky, J. L., & Gupta, R. (2004). The relationship of impulsivity, sensation seeking, coping, and substance use in youth gamblers. *Psychology of Addictive Behaviors, 18,* 49–55. doi:10.1037/0893-164X.18.1.49

Oas, P. (1984). Validity of the Draw-a-Person and Bender Gestalt Tests as measures of impulsivity with adolescents. *Journal of Consulting and Clinical Psychology, 52,* 1011–1019. doi:10.1037/0022-006X.52.6.1011

Overman, W. H., Frassrand, K., Ansel, S., Trawalter, S., Bies, B., & Redmond, A. (2004). Performance on the IOWA card task by adolescents and adults. *Neuropsychologia, 42,* 1838–1851. doi:10.1016/j.neuropsychologia.2004.03.014

Owsley, C., McGwin, G., & McNeal, S. F. (2003). Impact of impulsiveness, venturesomeness, and empathy on driving by older adults. *Journal of Safety Research, 34,* 353–359. doi:10.1016/j.jsr.2003.09.013

Paaver, M., Nordquist, N., Parik, J., Harro, M., Oreland, L., & Harro, J. (2007). Platelet MAO activity and the 5-HTT gene promoter polymorphism are associated with impulsivity and cognitive style in visual information processing. *Psychopharmacology, 194,* 545–554. doi:10.1007/s00213-007-0867-z

Pang, J. S., & Schultheiss, O. C. (2005). Assessing implicit motives in U.S. college students: Effects of picture type and position, gender and ethnicity, and cross-cultural comparisons. *Journal of Personality Assessment, 85,* 280–294. doi:10.1207/s15327752jpa8503_04

Patock-Peckham, J. A., Hutchinson, G. T., Cheong, J., & Nagoshi, C. T. (1998). Effect of religion and religiosity on alcohol use in a college student sample. *Drug and Alcohol Dependence, 49,* 81–88. doi:10.1016/S0376-8716(97)00142-7

Patock-Peckham, J. A., & Morgan-Lopez, A. A. (2006). College drinking behaviors: Mediational links between parenting styles, impulse control, and alcohol-related outcomes. *Psychology of Addictive Behaviors, 20,* 117–125. doi:10.1037/0893-164X.20.2.117

Patton, J. H., Stanford, M. S., & Barratt, E. S. (1995). Factor structure of the Barratt Impulsiveness Scale. *Journal of Clinical Psychology, 51,* 768–719. doi:10.1002/1097-4679(199511)51:6<768::AID-JCLP2270510607>3.0.CO;2-1

Pearson, P. R., Francis, L. J., & Lightbrown, T. J. (1986). Impulsivity and religiosity. *Personality and Individual Differences, 7,* 89–94. doi:10.1016/0191-8869(86)90112-1

Peluso, M. A. M., Hatch, J. P., Glahn, D. C., Monkul, E. S., Sanches, M., Najt, P., et al. (2007). Trait impulsivity in patients with mood disorders. *Journal of Affective Disorders, 100,* 227–231. doi:10.1016/j.jad.2006.09.037

Penas-Lledo, E., de Dios Fernandez, J., & Waller, G. (2004). Association of anger with bulimic and other impulsive behaviours among non-clinical women and men. *European Eating Disorders Review, 12,* 392–397. doi:10.1002/erv.588

Perez, J., & Torrubia, R. (1985). Sensation seeking and antisocial behaviour in a student sample. *Personality and Individual Differences, 6,* 401–403. doi:10.1016/0191-8869(85)90068-6

Petry, N. M., Kirby, K. N., & Kranzler, H. R. (2002). Effects of gender and family history of alcohol dependence on a behavioral task of impulsivity in healthy subjects. *Journal of Studies on Alcohol, 63,* 83–90.

Pfefferbaum, B., & Wood, P. B. (1994). Self report study of impulsive and delinquent behavior in college students. *Journal of Adolescent Health*, 15, 295–302. doi:10.1016/1054-139X(94)90602-5

Plastow, R. L. (2007). Lifestyle and chronic illness: Variables affecting risk perception. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 67, (7-B),* 4093.

Plouffe, L., & Gravelle, F. (1989). Age, sex and personality correlates of self actualization in elderly adults. *Psychological Reports, 65,* 643–647.

Pompili, M., Innamorati, M., Lester, D., Brunetti, S., Tatarelli, R., & Girardi, P. (2007). Gender effects among undergraduates relating to suicide risk, impulsivity, aggression and self-efficacy. *Personality and Individual Differences, 43,* 2047–2056. doi:10.1016/j.paid.2007.06.019

Pontzer, D. P. (2007). Testing reintegrative shaming theory as an explanation for involvement in bullying among university students: Parenting, personality, and the dyadic relationship between bullies and their victims. *Dissertation Abstracts International Section A: Humanities and Social Sciences, 68, (3-A),* 1171.

Quiroga, M. A., Hernandez, J. M., Rubio, V., Shih, P. C., Santacreu, J., & Howard, V. N. (2007). Influence of impulsivity-reflexivity when testing dynamic spatial ability: Sex and g differences. *The Spanish Journal of Psychology, 10,* 294–302.

Ramadan, R., & McMurran, M. (2005). Alcohol and aggression: Gender differences in their relationships with impulsiveness, sensation seeking and social problem solving. *Journal of Substance Use, 10,* 215–224. doi:10.1080/14657890412331319454

Rammsayer, T. H., & Rammstedt, B. (2000). Sex-related differences in time estimation: The role of personality. *Personality and Individual Differences, 29,* 301–312. doi:10.1016/S0191-8869(99)00194-4

Rawlings, D. (1984). The correlation of EPQ Psychoticism with two behavioural measures of impulsivity. *Personality and Individual Differences, 5,* 591–594. doi:10.1016/0191-8869(84)90034-5

Reeve, C. L. (2007). Functional impulsivity and speeded ability test performance. *International Journal of Selection and Assessment, 15,* 56–62. doi:10.1111/j.1468-2389.2007.00367.x

Reto, C. S., Dalenberg, C. J., & Coe, M. T. (1993). Dissociation and physical abuse as predictors of bulimic symptomatology and impulse dysregulation. *Eating Disorders: The Journal of Treatment and Prevention, 1,* 229–239. doi:10.1080/10640269308251162

Reynolds, B. (2003). Impulsivity and friends who smoke as predictors of adolescent smoking. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 63, (12-B),* 6122.

Reynolds, B., Ortengren, A., Richards, J. B., & de Wit, H. (2006). Dimensions of impulsive behaviour: Personality and behavioural measures. *Personality and Individual Differences, 40,* 305–315. doi:10.1016/j.paid.2005.03.024

Reynolds, B., Patak, M., Shroff, P., Penfold, R. B., Melanko, S., & Duhig, A. M. (2007). Laboratory and self-report assessments of impulsive behaviour in adolescent daily smokers and non smokers. *Experimental and Clinical Psychopharmacology, 15,* 264–271. doi:10.1037/1064-1297.15.3.264

Reynolds, B., Richards, J. B., & de Wit, H. (2006). Acute-alcohol effects on the experiential discounting task (EDT) and a question-based measure of delay discounting. *Pharmacology, Biochemistry and Behavior, 83,* 194–202. doi:10.1016/j.pbb.2006.01.007

Reynolds, B., Richards, J. B., Horn, K., & Karraker, K. (2004). Delay discounting and probability discounting as related to cigarette smoking status in adults. *Behavioural Processes, 65,* 35–42. doi:10.1016/S0376-6357(03)00109-8

Rigby, K., Mak, A. S., & Slee, P. T. (1989). Impulsiveness, orientation to institutional authority, and gender as factors in self reported delinquency among Australian adolescents. *Personality and Individual Differences, 10,* 689–692. doi:10.1016/0191-8869(89)90228-6

Rigby, K., Slee, P., & Mak, A. (1992). Impulsiveness, attitude to authority, and gender. *Psychological Reports, 71,* 121–122. doi:10.2466/PR0.71.5.121-122

Rim, Y. (1994). Impulsivity, venturesomeness, empathy and schizotypy. *Personality and Individual Differences, 17,* 853–854. doi:10.1016/0191-8869(94)90053-1

Robinson, T. N. (1990). Eysenck personality measures and religious orientation. *Personality and Individual Differences, 11,* 915–921. doi:10.1016/0191-8869(90)90272-S

Romero, E., Luengo, M. A., & Sobral, J. (2001). Personality and antisocial behaviour: Study of temperamental dimensions. *Personality and Individual Differences, 31,* 329–348. doi:10.1016/S0191-8869(00)00139-2

Rose, P. (2007). Mediators of the association between narcissism and compulsive buying: The roles of materialism and impulse control. *Psychology of Addictive Behaviors, 21,* 576–581. doi:10.1037/0893-164X.21.4.576

Roth, M., Hammelstein, P., & Brahler, E. (2007). Beyond a youthful behavior style: Age and sex differences in sensation seeking based on need theory. *Personality and Individual Differences, 43,* 1839–1850. doi:10.1016/j.paid.2007.06.004

Rowe, D. C., Vazsonyi, A. T., & Flannery, D. J. (1995). Sex differences in crime: Do means and within-sex variation have similar causes? *Journal of Research in Crime and Delinquency, 32,* 84–100. doi:10.1177/0022427895032001004

Ryff, C. D. M., & Heincke, S. G. (1983). Subjective organization of personality in adulthood and aging. *Journal of Personality and Social Psychology, 44,* 807–816. doi:10.1037/0022-3514.44.4.807

Sahoo, M. K. (1985). Prediction of personality dimensions and risk taking behavior. *Perspectives in Psychological Research, 8,* 57–62.

Saklofske, D. H., & Eysenck, S. B. G. (1983). Impulsiveness and venturesomeness in Canadian children. *Psychological Reports, 52,* 147–152.

Sasaki, H., & Kanachi, M. (2005). The effects of trial repetition and individual characteristics on decision making under uncertainty. *Journal of Psychology: Interdisciplinary and Applied, 139,* 233–246. doi:10.3200/JRLP.139.3.233-246

Schaughency, E., McGee, R., Shyamala, N., Feehan, M., & Silva, P. A. (1994). Self reported inattention, impulsivity and hyperactivity at ages 15 and 18 in the general population. *Journal of the American Academy of Child and Adolescent Psychiatry, 33,* 173–184. doi:10.1097/00004583-199402000-00004

Schwartz, S. J. (2007). The structure of identity consolidation: Multiple correlated constructs of one superordinate construct? *Identity, 7,* 27–49.

Schweizer, K. (2002). Does impulsivity influence performance in reasoning? *Personality and Individual Differences, 33,* 1031–1043. doi:10.1016/S0191-8869(01)00209-4

Segarra, P., Ross, S. R., Pastor, M. C., Montanes, S., Poy, R., & Molto, J. (2007). MMPI-2 predictors of Gray's two-factor reinforcement sensitivity theory. *Personality and Individual Differences, 43,* 437–448. doi:10.1016/j.paid.2006.12.013

Sigurdsson, J. F., Gudjonsson, G. H., Bragason, A. V., Kristjansdottir, E., & Sigfusdottir, I. D. (2006). The role of violent cognition in the relationship between personality and the involvement in violent films and computer games. *Personality and Individual Differences, 41,* 381–392. doi:10.1016/j.paid.2006.02.006

Simo, S., Santana, G., & Perez, J. (1991). A French Junior Sensation Seeking Scale (J-SSS). *Personality and Individual Differences, 12,* 669–670. doi:10.1016/0191-8869(91)90221-V

Simons, J. S. (2003). Differential prediction of alcohol use and problems: The role of biopsychological and social-environmental variables. *American Journal of Drug and Alcohol Abuse, 29,* 861–879. doi:10.1081/ADA-120026265

Simons, J. S., & Carey, K. B. (2006). An affective and cognitive model of marijuana and alcohol problems. *Addictive Behaviors, 31,* 1578–1592. doi:10.1016/j.addbeh.2005.12.004

Simons, J. S., Carey, K. B., & Gaher, R. M. (2004). Lability and impulsivity synergistically increase risk for alcohol-related problems. *American Journal of Drug and Alcohol Abuse, 30,* 685–694. doi:10.1081/ADA-200032338

Simons, J. S., Gaher, R. M., Correia, C. J., Hansen, C. L., & Christopher, M. S. (2005). An affective-motivational model of marijuana and alcohol problems among college students. *Psychology of Addictive Behaviours, 19,* 326–334. doi:10.1037/0893-164X.19.3.326

Smillie, L. D., Jackson, C. J., & Dalgleish, L. I. (2006). Conceptual distinctions among Carver and White's (1994). BAS scales: A reward-reactivity versus trait impulsivity perspective. *Personality and Individual Differences, 40,* 1039–1050. doi:10.1016/j.paid.2005.10.012

Smith, P., Waterman, M., & Ward, N. (2006). Driving aggression in forensic and non-forensic populations: Relationships to self-reported levels of aggression, anger and impulsivity. *British Journal of Psychology, 97,* 387–403. doi:10.1348/000712605X79111

Soloff, P. H., Kelly, T. M., Strotmeyer, S. J., Malone, K. M., & Mann, J. J. (2003). Impulsivity, gender, and response to fenfluramine challenge in borderline personality disorder. *Psychiatry Research, 119,* 11–24. doi:10.1016/S0165-1781(03)00100-8

Spence, J. T., Losoff, M., & Robbins, A. S. (1991). Sexually aggressive tactics in dating relationships: Personality and attitudinal correlates. *Journal of Social and Clinical Psychology, 10,* 289–304.

Spillane, N. S., & Smith, G. T. (2006a). *Empirical support for a multifaceted model of American Indian drinking.* Paper presented at the annual international meeting of the Research Society on Alcoholism, Baltimore, MD.

Spillane, N. S., & Smith, G. T. (2006b). *Personality risk for smoking behavior.* Unpublished manuscript.

Spinella, M. (2005). Prefrontal substrates of empathy: Psychometric evidence in a community sample. *Biological Psychology, 70,* 175–181. doi:10.1016/j.biopsycho.2004.01.005

Stanford, M. S., Greve, K. W., Boudreaux, J. K., Mathias, C. W., & Brumbelow, J. L. (1996). Impulsiveness and risk taking behavior: Comparison of high school and college students using the Barrett Impulsiveness Scale. *Personality and Individual Differences, 21,* 1073–1075. doi:10.1016/S0191-8869(96)00151-1

Stanford, M. S., Greve, K. W., & Dickens, T. J. (1995). Irritability and impulsiveness: Relationship to self reported impulsive aggression. *Personality and Individual Differences, 19,* 757–760. doi:10.1016/0191-8869(95)00144-U

Starrett, R. H. (1983). The conceptual commonality between impulsiveness as a personality trait and as an ego development stage. *Personality and Individual Differences, 4,* 265–274. doi:10.1016/0191-8869(83)90148-4

Stewart, M. E., Ebmeier, K. P., & Deary, I. J. (2004). The structure of Cloninger's tridimensional personality questionnaire in a British sample. *Personality and Individual Differences, 36,* 1403–1418. doi:10.1016/S0191-8869(03)00237-X

Stoltenberg, S. F., Batien, B. D., & Birgenheir, D. G. (2008). Does gender moderate associations among impulsivity and health-risk behaviors? *Addictive Behaviors, 33,* 252–265. doi:10.1016/j.addbeh.2007.09.004

Stoltenberg, S. F., Glass, J. M., Chermack, S. T., Flynn, H. A., Li, S., & Weston, M. E., et al. (2006). Possible association between response inhibition and a variant in the brain-expressed tryptophan hydroxylase-2 gene. *Psychiatric Genetics, 16,* 35–38. doi:10.1097/01.ypg.0000176528.30362.34

Sullivan, K. T. (1997). Contributions of personality and behavior to change in marital satisfaction. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 58, (6-B),* 3328.

Taylor, J. (2005). Substance use disorders and cluster B personality disorders: Physiological, cognitive, and environmental correlates in a college sample. *American Journal of Drug and Alcohol Abuse, 31,* 515–535. doi:10.1081/ADA-200068107

Thompson, M. P., Ho, C-H., & Kingree, J. B. (2007). Prospective associations between delinquency and suicidal behaviors in a nationally representative sample. *Journal of Adolescent Health, 40,* 232–237. doi:10.1016/j.jadohealth.2006.10.016

Tinius, T. P. (2003). The Intermediate Visual and Auditory Continuous Performance Test as a neuropsychological measure. *Archives of Clinical Neuropsychology*, 18, 199–214 doi:10.1093/arclin/18.2.199

Torrubia, R., Avila, C., Molto, J., & Caseras, X. (2001). The Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ) as a measure of Gray's anxiety and impulsivity dimensions. *Personality and Individual Differences, 31,* 837–862. doi:10.1016/S0191-8869(00)00183-5

Toyer, E. A. (1999). Development and validation of the A-ADHD: An MMPI-A scale to assess Attention-Deficit Hyperactivity Disorder in adolescents. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 60, (3-B),* 1319.

Uzieblo, K., Verschuere, B., & Crombez, G. (2007). The Psychopathic Personality Inventory: Construct validity of the two-factor structure. *Personality and Individual Differences, 43,* 657–667. doi:10.1016/j.paid.2007.01.008

van den Bree, M. B. M., Przybeck, T. R., & Cloninger, C. R. (2006). Diet and personality: Associations in a population-based sample. *Appetite, 46,* 177–188. doi:10.1016/j.appet.2005.12.004

van den Broek, M. D., Bradshaw, C. M., & Szabadi, E. (1992). The relationship between “impulsiveness” and hemispheric functional asymmetry, investigated with a divided visual field word recognition task. *Personality and Individual Differences, 13, (3),* 355–360. doi:10.1016/0191-8869(92)90114-5

Van der Linden, M., d’Acremont, M., Zermatten, A., Jermann, F., Laroi, F., & Willems, S. et al. (2006). A French adaptation of the UPPS impulsive behaviour scale: Confirmatory factor analysis in a sample of undergraduate students. *European Journal of Psychological Assessment, 22,* 38–42. doi:10.1027/1015-5759.22.1.38

Vazsonyi, A. T., Cleveland, H. H., & Wiebe, R. P. (2006). Does the effect of impulsivity on delinquency vary by level of neighbourhood disadvantage? *Criminal Justice and Behavior, 33,* 511–541. doi:10.1177/0093854806287318

Verdejo-Garcia, A., Bechara, A., Recknor, E. C., & Perez-Garcia, M. (2007). Negative emotion-driven impulsivity predicts substance dependence problems. *Drug and Alcohol Dependence, 91,* 213–219. doi:10.1016/j.drugalcdep.2007.05.025

Vigil-Colet, A. (2007). Impulsivity and decision making in the balloon analogue risk-taking task. *Personality and Individual Differences, 43,* 37–45 doi:10.1016/j.paid.2006.11.005

Vigil-Colet, A., & Codorniu-Raga, M. J. (2004). Aggression and inhibition deficits, the role of functional and dysfunctional impulsivity. *Personality and Individual Differences, 37,* 1431–1440. doi:10.1016/j.paid.2004.01.013

Vigil-Colet, A., & Morales-Vives, F. (2005). How impulsivity is related to intelligence and academic achievement. *The Spanish Journal of Psychology, 8,* 199–204.

Vigil-Colet, A., Morales-Vives, F., & Tous, J. (2008). The relationships between functional and dysfunctional impulsivity and aggression across different samples. *The Spanish Journal of Psychology, 11,* 480–487.

von Knorring, L., Almay, B. G., & Johansson, F. (1987). Personality traits in patients with Idiopathic Pain Disorder. *Acta Psychiatrica Scandinavia, 76,* 490–498. doi:10.1111/j.1600-0447.1987.tb02909.x

Walderhaug, E., Magnusson, A., Neumeister, A., Lappalainen, J., Lunde, H., Refsum, H., et al., (2007). Interactive effects of sex and 5-HTTLPR on mood and impulsivity during tryptophan depletion in healthy people. *Biological Psychiatry, 62, 593*–599. doi:10.1016/j.biopsych.2007.02.012

Weller, L. A. (2001). Cognitive inhibition and impulsivity in adult children of alcoholics and controls. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 61, (11-B),* 6154.

Weyers, P., Krebs, H., & Janke, W. (1995). Reliability and construct validity of the German versions of Cloninger's Tridimensional Personality Questionnaire. *Personality and Individual Differences, 19,* 853–861. doi:10.1016/S0191-8869(95)00128-X

White, T. L., Lejuez, C. W., & de Wit, H. (2007). Personality and gender differences in effects of d-amphetamine on risk taking. *Experimental and Clinical Psychopharmacology, 15,* 599–609. doi:10.1037/1064-1297.15.6.599

Wilson, M., & Daly, M. (2006). Are juvenile offenders extreme future discounters? *Psychological Science, 17,* 989–994. doi:10.1111/j.1467-9280.2006.01817.x

Wingo, M. K. (2002). The adolescent stress response to a naturalistic driving stressor. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 63, (2-B),* 1082.

Yang, H. (2002). Examination of perceptions of leisure boredom, personal characteristics, and family functions as predictors of aggressive behavioral tendencies of university students. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 63, (5-B),* 2570.

Zaleskiewicz, T. (2001). Beyond risk seeking and risk aversion: Personality and the dual nature of economic risk taking. *European Journal of Personality, 15,* 105–122. doi:10.1002/per.426

Zawacki, T. M. (2002). Alcohol's role in decisions to drive after drinking. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 63, (3-B),* 1613.

Zimmermann, G., Rossier, J., & Meyer de Stadelhofen, F. (2004). Validation of the French version of the Eysenck's impulsiveness questionnaire (I7): Influence of personality, gender and religion. *Annales Médico Psycholgiques, 162,* 116–121. doi:10.1016/j.amp.2003.02.001

Zimmermann, G., Rossier, J., Meyer de Stadelhofen, F., & Gaillard, F. (2005). Alexithymia assessment and relations with dimensions of personality. *European Journal of Psychological Assessment, 21,* 23–33. doi:10.1027/1015-5759.21.1.23

Zuckerman, M., Eysenck, S., & Eysenck, H. J. (1978). Sensation seeking in England and America: Cross-cultural, age and sex comparisons. *Journal of Consulting and Clinical Psychology, 46,* 139–149. doi:10.1037/0022-006X.46.1.139

APPENDIX C

Expanded Path Model Showing Subscales of Risky Impulsivity

In order to examine more closely the relationship between risky impulsivity, same-sex aggression, and sociosexuality, a path model was tested in which the three separate subscales of the risky impulsivity scale were entered as separate variables. This model indicated the extent to which the three subscales of risky impulsivity accounted for unique variance in same-sex aggression and sociosexuality. As with the main paper, the method used was maximum likelihood and path models were calculated separately for the men and women in the sample.

Male data. All three subscales of risky impulsivity had significant direct effects on same-sex aggression but only the health subscale had a significant effect on sociosexuality. This might be interpreted as showing that the physical and criminal risk subscales have no relationships with sociosexuality. However, the health subscale contained two items referring to sexual activity. Because the risky impulsivity scale was developed in order to predict aggression, no items referred to aggressive behaviour and, following this logic to evaluate risky impulsivity as a predictor of sociosexuality, the items referring to sexual activity were removed and the analysis re-run. Following this removal, all three subscales had significant direct effects on both sociosexuality and same-sex aggression (See Figure S1). This suggests that all three facets of risky impulsivity are related to both same-sex aggression and sociosexuality, but that the health subscale may show an inflated correlation with sociosexuality (and suppress the correlations between the other two subscales and sociosexuality), because in its full form it contains items which refer to sexual activity.

For men, all three subscales of risky impulsivity predicted same-sex aggression equally well. However the health subscale predicted significantly more variance in sociosexuality – even with the items referring to sexual activity removed – than the physical and criminal risk subscales, which did not differ from each other. This suggests that while a relatively domain-general measure of risk-taking might be well suited to predicting aggression, prediction of sociosexuality might benefit from a measure more focused on health risks. That said, although the risky impulsivity scale might correlate with these two outcome measures in slightly different ways, the full scale shares enough variance with each of these outcome measures to account for the correlation between them.

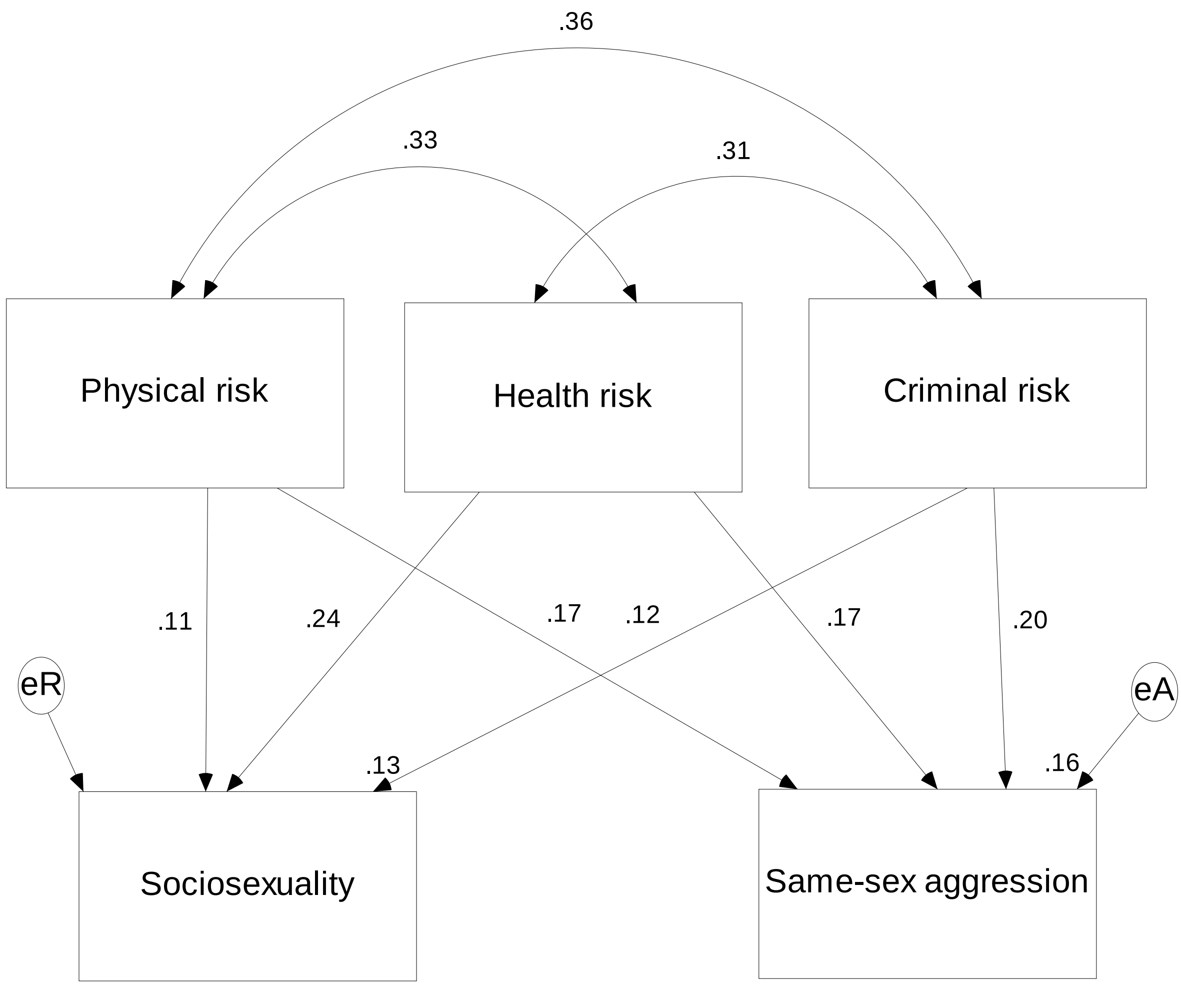

Figure 4. Standardised direct effects of the three subscales of risky impulsivity on same-sex aggression and sociosexuality, for male participants

Female data. All three subscales of risky impulsivity had significant direct effects on same-sex aggression (although the effect for criminal risk was very small), but only the health subscale had a significant effect on sociosexuality. Again, the items referring to sexual activity were removed from the health subscale and the analysis re-run. Following this removal, all three subscales had significant direct effects on both sociosexuality and same-sex aggression (see Figure S2), although the effect for criminal risk was very small for both outcomes.

For women, all three subscales of risky impulsivity predicted same-sex aggression equally well. However the health subscale predicted significantly more variance in sociosexuality than the physical and criminal risk subscales, which did not differ from each other. This suggests that a domain-general measure of risk-taking might be more suited to predicting aggression, while a more specific measure might be better for predicting sociosexuality. It further suggests that the different facets of risky impulsivity predict same-sex aggression and sociosexuality in similar ways in women and in men.

Overall, the results of the extended path models demonstrated that the different facets of risky impulsivity predicted same-sex aggression and sociosexuality in slightly different ways. However, the different facets do all predict some variance in both behaviours. In the main analysis, therefore, the risky impulsivity scale was re-combined and analysed as a single scale.

Appendix C: Expanded Path Model

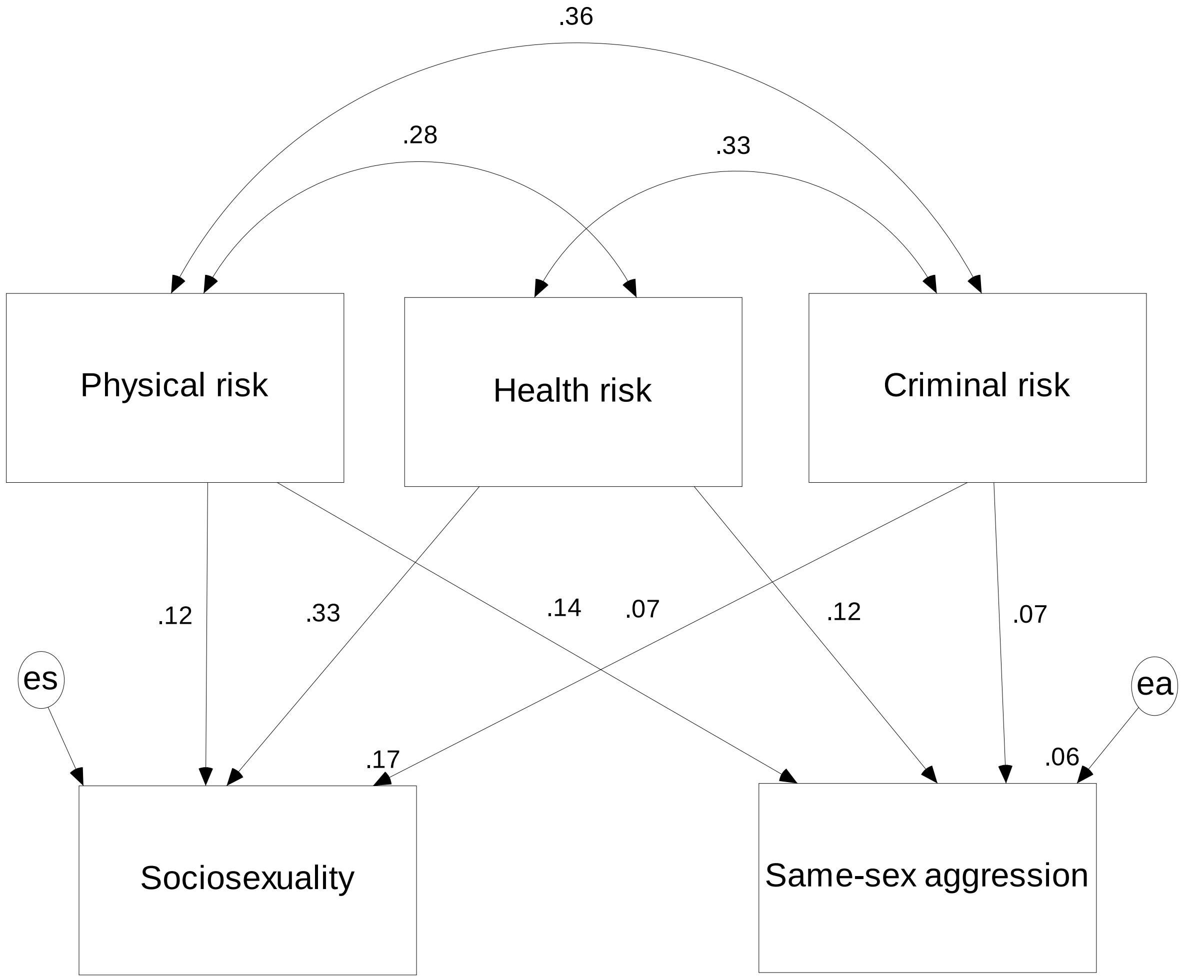

Figure 5. Standardised direct effects of the three subscales of risky impulsivity on same-sex aggression and sociosexuality, for female participants